Modicon TSX Quantum

PROFIBUS–DP under Modsoft

User Manual

840 USE 468 00

01/99

GROUPE SCHNEIDER

■ Merlin Gerin ■ Modicon ■ Square D ■ Telemecanique

33000240.02

Breite: 185 mm
Höhe: 230 mm

Data, Illustrations, Alterations
Data and illustrations are not binding. We reserve the right to alter products in line with our policy of continuous product development. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us using the form on one of the last pages of this publication.

Training
Schneider Automation offers suitable further training on the system.

Hotline
See addresses for the Technical Support Centers at the end of this publication.

Trademarks
All terms used in this publication to denote Schneider Automation products are trademarks of Schneider Automation.

All other terms used in this publication to denote products may be registered trademarks and/or trademarks of the corresponding Corporations.
Microsoft and MS-DOS are registered trademarks of Microsoft Corporation, Windows is a brandname of Microsoft Corporation in the USA and other countries.
IBM is a registered trademark of International Business Machines Corporation.
Intel is a registered trademark of the Intel Corporation.

Copyright
All rights are reserved. No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, including copying, processing or by online file transfer, without permission in writing by Schneider Automation. You are not authorized to translate this document into any other language.

© 1999 Schneider Automation GmbH. All rights reserved

Terminology

Note This symbol emphasizes important facts.

Caution This symbol refers to a frequent source of error.

Warning This symbol points to a source of danger that may cause financial or health damage or have other aggravating consequences.

Expert This symbol is used when more detailed information, intended exclusively for experts, is given. To understand and apply it requires special training. Skipping this information will not interfere with understanding the document, no restrict standard application of the product.

Tip This symbol is used for Tips & Tricks.

Path This symbol identifies the use of paths in software menus.

Figures are annotated in the spelling corresponding to international practice and approved by SI (Systéme International d' Unités).
An example of this is the space following the thousands and the decimal point in the number 12 345.67.

Application Note

Caution The relevant regulations must be observed for control applicatons involving safety requirements.
For reasons of safety and to ensure compliance with documented system data, repairs to components should be performed only by the manufacturer.

Breite: 185 mm
Höhe: 230 mm

Objectives

List of Abbreviations:

ASIC	Application Specific Integrated Circuit
AWP	User program
BP	Backplane (Quantum)
BMFT	Bundesministerium für Forschung und Technik
C	Client
CC	Coordination Channel
CCMP	Coordination Channel Communication Manager: Profile specific module
CDS	Configuration Data Download Server: local entity that controls the configuration process and distributes configuration data on a single CPU board, expert or communication adapter.
CFB	Communication Function Block
CM	Communication Manager
CMI	Computer Memory Interface
CMP	Communication Manager Profilabhängig (physikalisch)
CRDR	Cyclic Request Data with Reply (zyklisches Empfangen mit Quittierung)
CRL	Communication Relation List
CRP 811	PROFIBUS-DP-Module for TSX Quantum
CSRD	Cyclic Send and Request Data with reply (zyklisches Senden und Empfangen mit Quittierung)
DDB	Development Data Base
DDLM	Direct Data Link Mapper
DIP	Data Information Base

DP	Decentrale Peripherie
FCS	Frame Check Sequenz
FDL	Fieldbus Data Link
FMA	Fieldbus MAnagement
FMA7	Fieldbus MAnagement Schicht 7
FO	Fiber Optic
GSD, DDB	Device Data Base (PROFIBUS-DP)
IC	Information Channel
ICM	Information Channel Manager
ICMP	Information Channel Communication Manager: Profile specific module
ICOM	Information Channel Communication Object Manager (linked with the ICMP for FMS). This module does all communication object and VD handling needed for conversions between real and virtual (open) object representations.
IEC	International Electronic Commite
IEEE	Institute of Electric and Electronic Engineers
I/O	Input/Output
ISO	International Standardization Organization
ISP	Interoperable System Project
LAN	Local Area Network, Lokales Netz
LLI	Lower Layer Interface (in Schicht 7)
LLC	Logical Link Control, logische Verbindungssteuerung
LMS	Large Modul System: Arbeitstitel für den Produktnamen Quantum (Working title for the Quantum controllers)
MAP	Manufacturing Automation Protocol, spezielles Kommunikationsprofil
MAC	Medium Access Control, Medium-Zugriffsverfahren

Breite: 185 mm
Höhe: 230 mm

MB+	Modbus+
MMI	Man Machine Interface
MMS	Manufacturing Message Specification
MMSE	MMS über Ethernet
OS	Operating System
OSI	Open System Interconnection, offene Kommunikation
PC	Programmable Controller, SPS
PCMS	Programmable Controller Message Specification
PCMCIA	Personal Computer Memory Card International Association (PC–Card): Arbeitstitel für das Quantum-Modul NHP 911 (Working title for the Quantum modul NHP 911)
PDU	Protocol Data Unit
PHY	Physical
PLC	Programmable Logical Control
PLCC	Plastic Leadless Chip Carrier
PNO	PROFIBUS User Organisation e.V.
PROFIBUS	ProcessFieldBus
PUTE / PADT	Programm and Test Equipment
PV	ProcessVariable
Quantum	Product name
RDR	Request Data with Reply (Daten empfangen mit Quittierung)
RS 485	PROFIBUS-Schnittstelle für kabelgebundene Übertragung (Recommended Standard for a Communication Interface)
SAP	Service Access Point (Dienstzugangspunkte für einzelne Softwareschichten)
SDA	Send Data with Acknowledge (Daten senden mit Quittierung)

SDN	Send Data with No acknowledge (Daten senden unquittiert)
SOL	Small Out-Line package
SPS	Speicher Programmierbare Steuerung
SPU xxx	Produktname für Programmiersoftware PROFIBUS
SRAM	Static RAM
SRD	Send and Request Data with reply
SS / IF	Interface
TDC	Technical Design Center
TIO	Terminal I/O
UART	Universal Asyncronous Receiver/Transmitter
VD	Virtual Devise
VRTX	Versatile Real-Time Executive

Breite: 185 mm
Höhe: 230 mm

Arrangement of the Guide

Chapter 1 describes the ISO–OSI–reference model and generally about PROFIBUS DP

Chapter 2 describes the product overview and State RAM assignements PROFIBUS DP

Chapter 3 describes the hardware installation of PROFIBUS DP

Chapter 4 describes the global portions of software configuration from PROFIBUS DP

Chapter 5 describes Diagnostic parameters and screens for CRP811

Appendix contains the module description

Related Documents

Modicon Ladder Logic
Block Library, User Guide
Best. Nr.:840 USE 101 00

Quantum Automation Series Hardware
Reference Guide
Best.Nr.: 840 USE 100 00

Installationsrichtlinien der PROFIBUS Nutzerorganisation
Best. Nr.: 2.111
PROFIBUS Nutzerorganisation e.V.
Haid– und Neu–Straße 7
D 76131 Karlsruhe

EN 50170 Fieldbus Part 2
DIN 19429 Part1 and 3

TIO Benutzerhandbuch
890 USE 104 02

Modicon TSX Momentum
E / A Einheiten
Benutzerhandbuch
870 USE 002 02

TSX Momentum
Bus–Adapter Profibus DP
Benutzerhandbuch
870 USE 004 02

DEA 203 im Profibus DP
Handbuch

Handbuch A120
Komponenten

Validity Note

The following tables contain the relationships between Modsoft and the neccessary software and firmware:

Required Modsoft/Exec		**At Modsoft V 2.32**	**At Modsoft V 2.4**	**At Modsoft >=V 2.51**
Modul package	**Module**	**FW / SW**	**FW / SW**	**FW / SW**
Exec	CPU x13	V2.00 (Q186V200.bin)	V2.11 (Q186V211.bin)	V2.14 (>=2.11) (Q186V214.bin)
	CPU 424	V2.00 (Q486V200.bin)	V2.11 (Q486V211.bin)	V2.12 (Q486V212.bin)

For DP–Konfiguration:		**At Modsoft V 2.32**	**At Modsoft V 2.4**	**At Modsoft >=V 2.51**
Modul– / SW– package	**Module**	**FW / SW**	**FW / SW**	**FW / SW**
140 CRP 811 00	CRP 811	V1.11D	V2.05D	>=V3.00D
	NHP811	V5.01A	V5.02G	>=V5.02I
332 SPU 833 01	SPU 931	V1.10	V2.01	>=V3.00
	GSD 931	V1.10	V2.00	>=V3.00 (GSD 831)
	SPU 832 (KON–DP)	V1.2 (EN / DE)	V1.4 (EN / DE)	>= V1.6

☞ **Note** The update of the new releases must be realized for all modules. A mixing from version 2.xx at CRP811/SPU931 with the old versions 1.xx at CRP811 / SPU931 is not allowed.

☞ **Note** A mixing from version 3.xx at CRP811/SPU931 with the old versions 2.xx at CRP811 / SPU931 is not allowed.

Exclude: The modul CRP811 with FW V3.xx is installed in a **plant,** which is configured with SPU931 version 2.xx, is running together with CRP811 with FW version 2.xx.

Breite: 185 mm
Höhe: 230 mm

Contents

Chapter 1 General 1

1.1 Introduction to the Reference Model 3
1.1.1 Open communication 3
1.1.2 The ISO OSI Reference Model 4
1.1.3 The Seven Layers in a Telephone Conversation (example) 6
1.2 General Information about PROFIBUS–DP 7
1.2.1 Layers for the PROFIBUS–DP 7
1.2.2 Basic Characteristics 9
1.2.3 System Configurations and Device Types 10
1.2.4 System Behavior 12
1.2.5 Data Transmission between the DP Master (class 1) and the DP Slaves . . 13
1.2.6 Sync and Freeze Mode (not supported by CRP 811) 14
1.2.7 Data Transmission between DP Master and Configuration Devices 15
1.2.8 Protection Mechanisms 16
1.2.9 Device Database Files (GSD) Enable Open Configuration 17
1.2.10 Ident Number 17
1.3 CRP 811 Functionality Master Class 1 and Performance Data 18
1.3.1 DP Slave Reads Diagnostic Data and Files It in State RAM 18
1.3.2 Send Parameterization Data to DP Slave 19
1.3.3 Sending Configuration Data to the DP Slave 19
1.3.4 Cyclic Transmission of Input and Output Data from State RAM 20
1.3.5 Control Commands 21
1.3.6 Auto–Clear 21
1.3.7 CRP811 Failure Behavior 22
1.3.8 Performance 24
1.3.9 CRP811 00 Operation in Decentralized I/O 26

Chapter 2 Overview PROFIBUS-DP 27

2.1 Product Overview 29
2.1.1 TSX–Quantum Components for PROFIBUS–DP 30
2.1.2 Slave Component Assignments (PROFIBUS-DP) 31
2.2 TIO and Compact Slave Assignment Tables 34
2.2.1 BDO 354 – Digital output / 32 bits, 24 VDC 34
2.2.2 BDI 354 – Digital input / 32 bits, 24VDC 36
2.2.3 BDM 344 – Digital input and output / per 16 bits, 24 VDC 38
2.2.4 DAP 204 – Digital output / 4 bits, 24 VDC 40
2.2.5 DAP216 – Digital output / 16 bits, 24VDC 41
2.2.6 DAP 220 – Digital input and output / per 8 bits, 24VDC 42

2.2.7 DEP216 – Digital input / 16 bits, 24VDC 44

Chapter 3 Installation Guide (Hardware) 47

3.1 General Information on Installing PROFIBUS 49
3.1.1 Specific PROFIBUS–DP Requirements for Quantum/Modsoft 49
3.1.2 Network sample of PROFIBUS DP with Quantum, Compact, TIOs and Third Party products 50
3.1.3 Configuration Limits 50
3.1.4 Segmentation Sample of a PROFIBUS System with Repeaters 51
3.1.5 Methods of Cabling and Bus Design for PROFIBUS DP 52
3.2 Regulations for Installation 53
3.2.1 Bus Segment Installation 53
3.2.2 Cabinet Line Layout 53
3.2.3 Line Layout Outside Cabinets 54
3.2.4 Trailing Lines 54
3.2.5 Outdoor Line Layout 55
3.2.5.1 Surge protection for Bus Lines up to 500 kBaud (outdoor) 55
3.2.5.2 Surge protection for Bus Lines over 500 kBaud to 1.5MBaud (outdoor) with optical fiber cables 58
3.2.5.3 Additional Notes 58
3.2.6 Grounding, Potential Equalization and Shielding 58
3.2.6.1 Grounding and Shielding of Systems with Potential Equalization 58
3.2.6.2 Grounding and Shielding of Systems without Potential Equalization 60
3.2.7 PROFIBUS–DP Repeaters 62
3.2.8 Backplane Grounding of the Quantum CPU 63
3.2.9 Grounding of Backplane DTA 200 of the Compact Periphery 64
3.2.10 Grounding of TIO Components 64
3.2.11 Additional Grounding Measures 65
3.2.12 Example of an Indoor System ”with” Potential–Equalization Lines 66
3.2.13 Example of an Indoor System ”without” Potential–Equalization Lines 67
3.3 Specifications 68
3.3.1 Cable specifications 68
3.3.2 Connector Specifications 69
3.3.2.1 Pin Assignment NAD 911 69
3.3.2.2 Cable installation on NAD911 02 70
3.4 Schneider Automation Products for PROFIBUS Installation with Quantum 71
3.5 Example of PROFIBUS Test Certificate 72

Chapter 4 Software Configuration 75

4.1 Information for PROFIBUS DP 77
4.1.1 General 77
4.1.2 Relationships between tools 78
4.2 Software Packages and their Features (DP Configuration) 80
4.3 Directory Structure for Programs and Data 82
4.4 Configuration Step by Step 83
4.4.1 Modsoft Configuration Part (Step 1) 83
4.4.2 Bus Topologie Configuration (Step 2) 85
4.4.3 Mapping of I/O and Bus Project (Step 3) 87
4.4.4 Initiate Communication (Step 4) 89

Chapter 5 Diagnostic for CRP 811 91

5.1 Scope 93
5.2 RS 232C Diagnostic Interface 95
5.2.1 Print out Modus 96
5.2.2 Menu System 97
5.2.2.1 Main Menus 97
5.2.2.2 Error Report menu (e) 97
5.2.2.3 DP Data Menu (d) 97
5.2.2.4 Global Data Menu (g) 97
5.2.2.5 Firmware Update Menu (u) 98
5.2.2.6 Terminal Setup Menu (t) 98
5.2.2.7 Expert Mode Menu (x) 98
5.2.2.8 Board Reset Menu (r) 98
5.2.2.9 Memory Browser Menu (b) 99
5.2.2.10 Task Information Menu (i) 99
5.2.2.11 Debug Mask Menu (m) 99
5.3 LED Diagnostic 100
5.4 Diagnostics for the CDS task 102
5.5 Diagnostics for the CCMP Task 107
5.6 Diagnostics for the Backplane Handler Task 113
5.7 Diagnostics for the PC Card handler task 114
5.8 Textboxes for Terminal Menu Handler 115

Appendix AModule Discriptions 137

140 CRP 811 00:
Communication Module PROFIBUS–DP 139

AS–BDEA 203
PROFIBUS–DP Coupler 151

Chapter 1
General

In this chapter you can read about:

- ☐ ISO–OSI–Referenzmodell
- ☐ Imaging of the model into PROFIBUS DP

Breite: 185 mm
Höhe: 230 mm

2 General

1.1 Introduction to the Reference Model

The PROFIBUS is a proven fieldbus for communication between PCs, PLCs, control and observation units, sensors and actuators , in accordance with EN 501 70 (DIN 19245). It is:

□ Open

□ Vendor–independent

□ Proven

□ Certified

□ Future–oriented

In order to aid your general understanding, here are some key communication concepts relevant to PROFIBUS.

1.1.1 Open communication

Open communication (OSI = Open System Interconnection) refers to data exchange between stations by different manufacturers via a data network using standardized processes.
In 1984 the ISO (International Standardization Organization) passed the international standard ISO 7498 as a basis for open communication, also known as the ISO OSI reference model.

Breite: 185 mm
Höhe: 230 mm

1.1.2 The ISO OSI Reference Model

Layer	Layer	Meaning
7 Application, Processing	7 Application	Provides useful communication services for the user.
6 Presentation	6 Presentation	Determines the meaning of data exchanged between user programs in different stations.
5 Session, Communication Control	5 Session	Provides the tools required for opening, carrying out and ending a communication session. Communication between layers is synchronized using these tools.
4 Transport	4 Transport	Defines secure data transport for larger amounts of data via several transmission paths (buses) and stations.
3 Network	3 Network	Defines the route for transmitting messages via several transmission paths (buses) and stations.
2 Data Link	2 Data Link	Defines the bus access control functions, ensures data security, processes transmission protocols and telegrams.
1 Physical	1 Physical	Chooses the transmission medium and the physical bus interface.

As the table indicates, the reference model is made up of 7 layers. Each layer carries out a defined range of functions that will be described below. For each layer there are also a variety of national and international standards. Protocols are carried out between communication partners in the same layer. Communication between two devices only functions when both devices have the same standards (and thus, the same protocols) implemented on all existing layers. Some of these layers can be left empty.

The sum of protocols used by the reference model is also referred to as communication profile. In order to exchange data via a common data network, devices must have the same communication profile, e.g. MAP, PROFIBUS, MMSE.

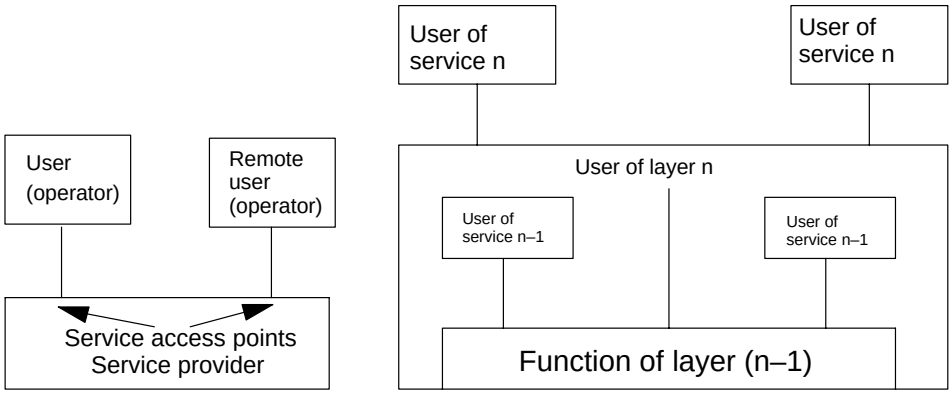


Figure 1 Service model (left), recursive application of service model (right)

Each layer provides services for the next layer up at what is called the service access point (SAP) (Figure 1, left). Each service access point has an address in the reference model. The layer currently under observation in the reference model then becomes the user in relation to the layer below it (Figure 1, right). The advantage of the layer model is that the user only needs to master the functionality of the layer it deals with directly; the other layers remain hidden.

Only layers 1 and 2 are required if, for example, data are only to be transferred over a point–to–point connection. The higher–level layers provide more comfort for more complex configurations. A setup that goes up to layer 7 frees the user (programmer) completely from all technical aspects of the communication, and he can use his application in a familiar environment. At the sending device, the data flows from top to bottom through the layers, and at the receiving device from bottom to top. In each layer other than layer 1, the sending end adds protocol information that is then used in the corresponding layer on the receiving end (Figure 2).

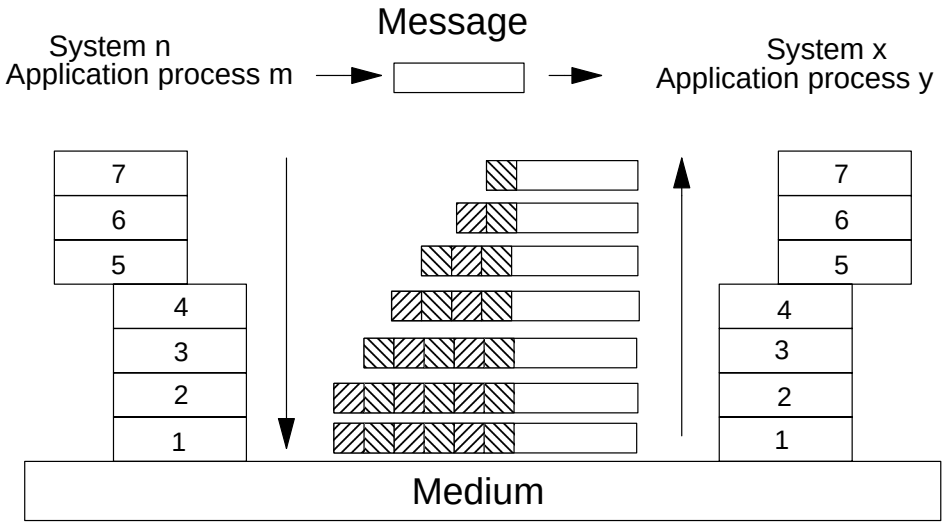


Figure 2 Information flow in the reference model

Breite: 185 mm
Höhe: 230 mm

1.1.3 The Seven Layers in a Telephone Conversation (example)

Since the description of the OSI reference model is very abstract, we will try to explain what happens using a telephone conversation as our example.

Layer	Meaning	Example
7 Application	Communication request from the application	Boss asks secretary to communicate data by telephone from Frankfurt to Tokyo
6 Presentation	Determine transfer syntax	Language – English
5 Session	Dialog management	If the connection is lost for whatever reason, a new connection is established; where necessary, the session is spread out over several phone conversations; synchronization
4 Transport	Segmentation, repe–tition, confirmation, flow control	Adapt information flow to allow for breathing; confirm whether understood; adjust speaking speed
3 Network	Routing	Dialing protocol of the long–distance exchanges
2 Data Link	Telegram composition error check Media access	Compose sentences, if necessary spell out words (redundancy to prevent errors); who may speak? Special rules e.g. for conference calls
1 Physical	Bit transmission; coupling to medium	Sound transmission; conversion from sound waves to electrical signals

1.2 General Information about PROFIBUS–DP

PROFIBUS–DP (Decentralized Process Periphery) is a version of PROFIBUS that has been optimized for high–speed communication using the proven qualities of PROFIBUS transmission technology and bus access protocols, but supplemented with extended functions that meet the unique requirements posed by decentralized process periphery.

PROFIBUS–DP has been designed to carry out high–speed data exchange on the sensor–actuator level. Here, central controllers (e.g., PLCs) communicate with their distributed input and output devices via a high–speed serial link. Most of the data communication with these distributed devices is done in a cyclic manner. The central controller (master) reads the input information from the slaves and writes the output information to the slave devices. This process requires the bus cycle time to be shorter than the central controller's program cycle time, which in many applications is approximately 10 msec.

1.2.1 Layers for the PROFIBUS–DP

The PROFIBUS–DP only uses the functions in layers 1 and 2 of the OSI reference model. Layers 3 through 7 are not defined. Layer 7 (application layer) is not used in order to achieve the required speed. The Direct Data Link Mapper (DDLM) provides the user interface with comfortable access to layer 2. The application functions for the user and the system and device behavior for the various PROFIBUS–DP device types are defined in the user interface.

Breite: 185 mm
Höhe: 230 mm

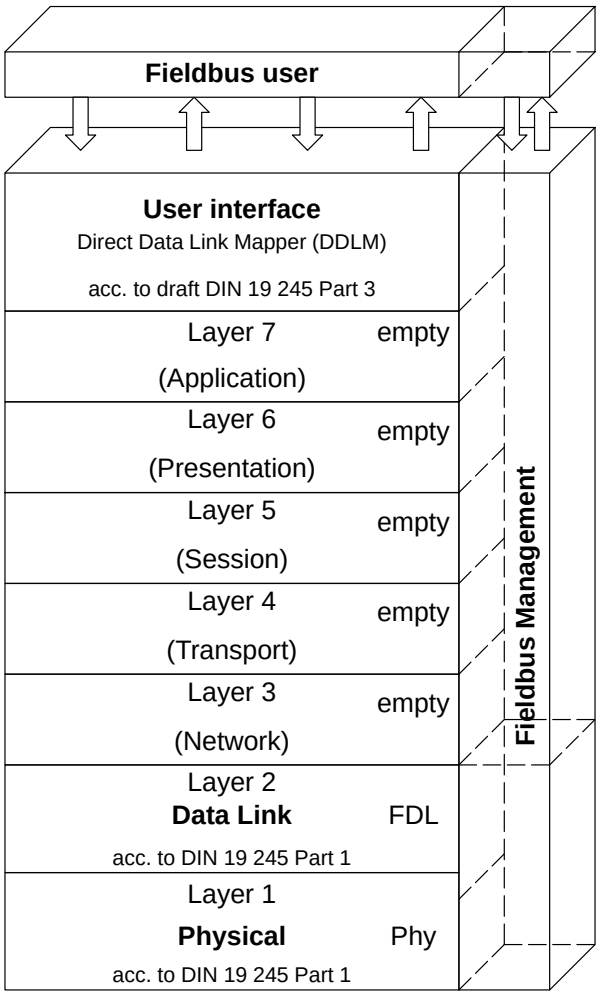


Figure 3 PROFIBUS–DP layers

8 General Information

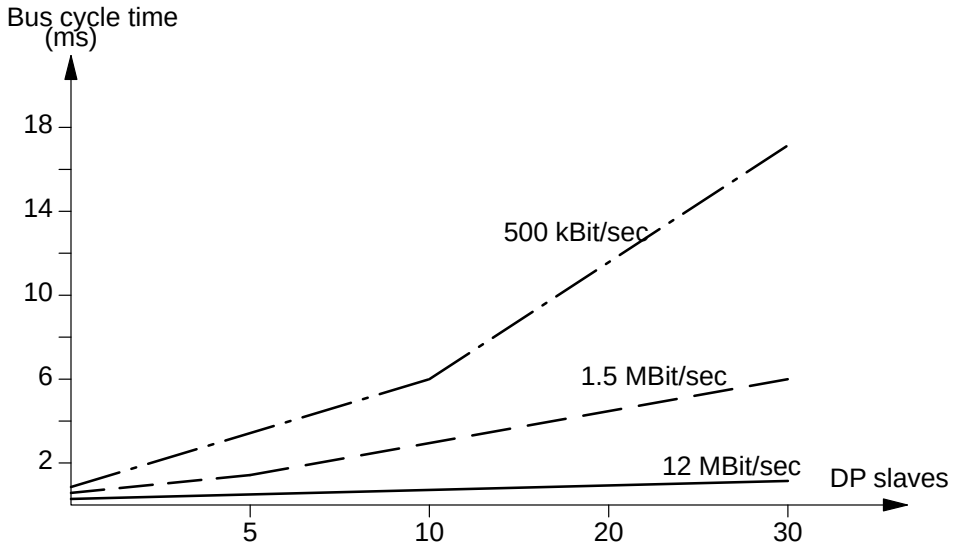
.00

1.2.2 Basic Characteristics

The success of a bus system depends on more than on high data throughput rates. It must also be easy to install and service, provide good diagnostic capabilities and error–free, proven transfer technology in order to satisfy the user's requirements. PROFIBUS–DP combines these characteristics in an optimized manner.

Speed
In order to transfer 2 bytes of input and 2 bytes of output data per device distributed over 32 stations, PROFIBUS–DP requires approx. 6 msec at 1.5 MBit/sec and approx. 2 msec at 12 MBit/sec. This fully satisfies the system reaction time requirement. Figure 4 displays PROFIBUS–DP's transmission time relative to the number of devices and the transfer speed.

DP's high rate of data throughput can be traced to the fact that input and output data are transferred in a message cycle using layer 2's Send and Receive Data service (SRD service). In addition, minimum requirements have been defined for protocol implementation efficiency and the transfer speed can be increased to up to 12 MBit/sec.



Test conditions:
Each slave has 2 bytes of input data and 2 bytes of output data.
The minimum slave interval time is 200 μsec, TSDI = 37 bit times, TSDR = 11 bit times

Figure 4 Bus cycle time of a PROFIBUS–DP Mono–master system

Breite: 185 mm
Höhe: 230 mm

Diagnostic functions
The extensive diagnostic functions of PROFIBUS–DP enable fast location of errors. Diagnostic messages are transmitted over the bus and collected at the master. These messages are divided into three levels:

- Station–related diagnostics
  These messages concern the general operational status of the whole device, e.g. low voltage or excessively high temperature.

- Module–related diagnostics
  These messages indicate that a fault is present in a specific I/O range, e.g. 8–bit output module of a device.

- Channel–related diagnostics
  These messages indicate an error at an individual input/output bit (channel), e.g. short circuit on output 7.

Handling and installation (see PNO guidelines)
The RS 485 transfer technology is easy to use. The installation of the twisted–pair cable and the PROFIBUS devices must be carried out according to the PNO guidelines in 2.111. The bus structure permits addition and removal of stations or step–by–step commissioning of the system without influencing the other stations. Later expansions have no effect on stations which are already in operation.

1.2.3 System Configurations and Device Types

PROFIBUS–DP can be used with Mono–master or Multi–master systems. This provides a high degree of flexibility during system configuration. Up to 126 devices (master or slaves) can be connected to one bus. The description of the system configuration consists of the number of stations, the assignment between the station address and the I/O addresses, I/O data format, diagnostic message format and the bus parameters used.

Each PROFIBUS–DP system is made up of a variety of device types. There are three types of devices, each one used for carrying out different tasks:

DP Master Class 1 (DPM1)
This is a central controller that exchanges information with decentralized stations (DP slaves) within a specified message cycle. Typical devices include programmable controllers (PLCs), numerical controllers (CNC) or robotic controllers (RC).

DP Master Class 2 (Third party)
This type of device includes programming, configuration and diagnostic devices. They can be used during commissioning for configuration of the DP system.

DP Slave
A DP slave is a peripheral device (sensor/actuator) that collects input information and sends output information to the periphery. There are also devices which supply only input information or only output information. Typical DP slave devices include those with binary I/Os for 24 V or 230 V, analog inputs, analog outputs, counters, etc.

The amount of input and output information depends on the device type. A maximum of 246 bytes of input information and 246 bytes of output information is permitted. For reasons of expense and implementation, many of the devices available today work with a maximum user data length of 32 bytes.

In **Mono–master systems** only one master is active on the bus during the operating phase of the bus system. Figure 5 shows the system configuration of a Mono–master system. The programmable controller is the central control component. The distributed DP slaves are linked to the central controller via the transfer medium. This system configuration achieves the shortest bus cycle time.

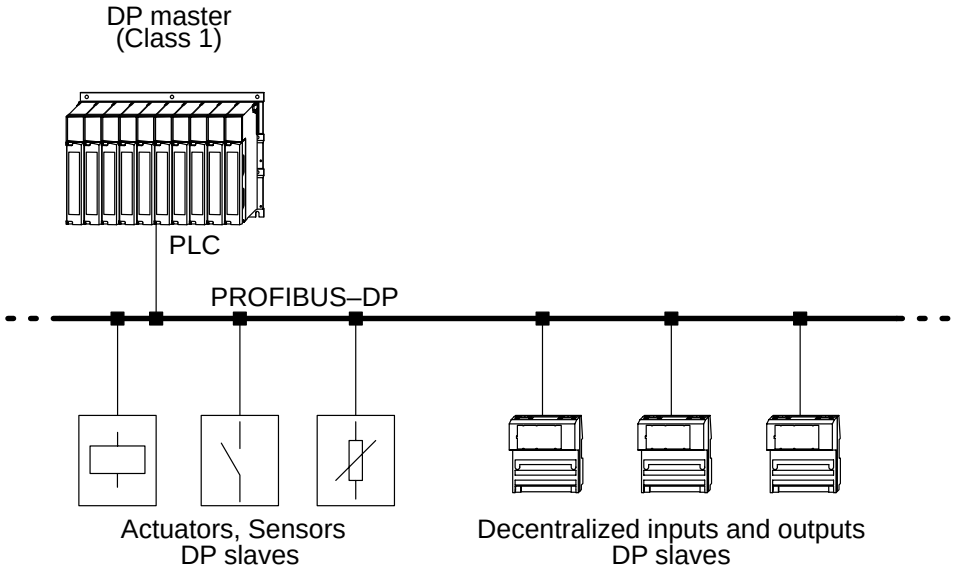


Figure 5 PROFIBUS–DP Mono–master system

In **Multi–master configurations** several masters are connected to one bus. These masters are either independent subsystems each consisting of one DPM1 and its assigned slaves, or additional configuration and diagnostic devices (see Figure 6).
The input and output images of the DP slaves can be **read** by all DP masters. However, only one DP master (the DPM1 assigned during configuration) may

Breite: 185 mm
Höhe: 230 mm

write–access the outputs.
Multi–master systems achieve an intermediate bus cycle time.

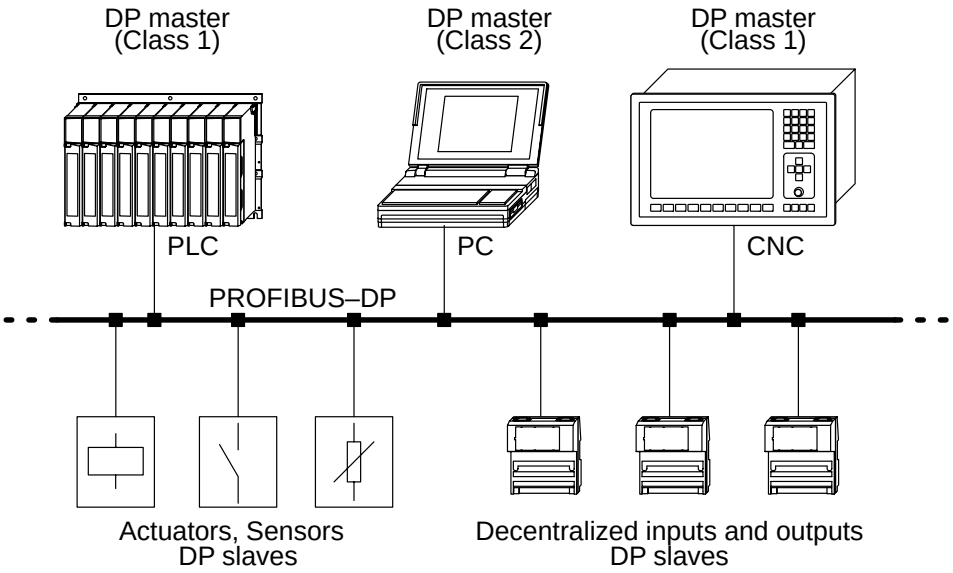


Figure 6 PROFIBUS–DP Multi–master system

1.2.4 System Behavior

The system behavior for PROFIBUS–DP has been standardized in order to ensure device exchangeability. System behavior is determined primarily by the operating status of the DPM1. The DPM1 can either be controlled locally or via the bus by the configuration device. There are three main states:

Stop
No data transmission between the DPM1 and the DP slaves occurs in this state.

Clear
In this state, the DPM1 reads the input information of the DP slaves and holds their outputs in fail–safe status.

Operate
In this state, the DPM1 is in the data transfer phase. In a cyclic data communication, inputs of the DP slaves are read and output information is transferred to the DP slaves.

The DPM1 sends its local status to all of its assigned slaves cyclically with a Multicast command at a configurable time interval.

The system reaction to an error during the transfer phase of the DPM1, e.g. a DP slave failure, is determined by the **”auto–clear”** configuration parameter.

If this parameter is set to ”true”, the DPM1 switches all outputs of all assigned DP slaves to the fail–safe state as soon as a DP slave is no longer ready for user data transmission. Then the DPM1 switches to the Clear state.

If this parameter is set to ”false”, the DPM1 remains in the Operate state even when an error occurs, and the user can specify the system reaction himself.

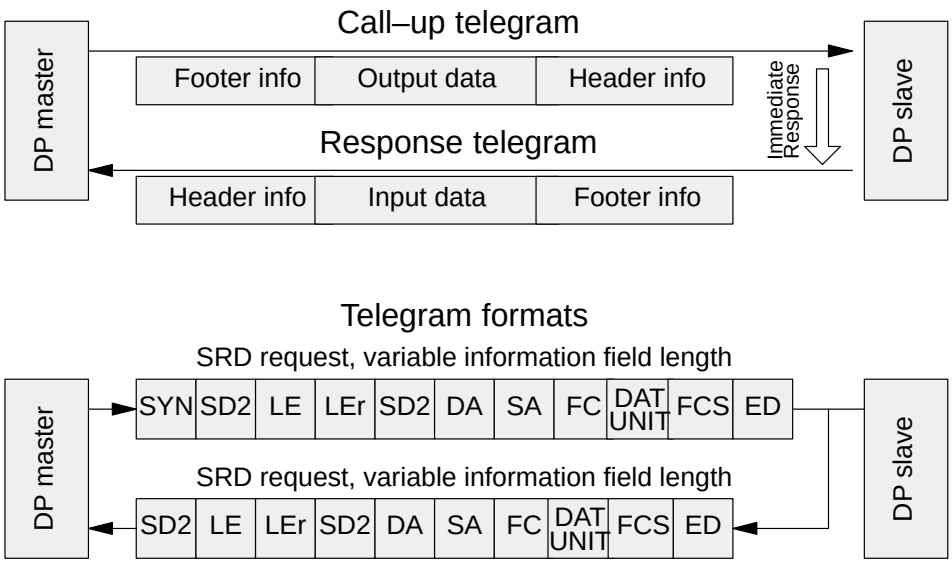
Caution: CRP811 only supports auto–clear = false

1.2.5 Data Transmission between the DP Master (class 1) and the DP Slaves

Data transmission between the DPM1 and the slaves assigned to it is executed automatically by the DPM1 in a defined, recurring order. During configuration of the bus system, the user specifies the assignments of the DP slaves to the DPM1. Which DP slaves are to be included in or excluded from cyclic user data transmission is also defined during configuration.

Data transmission between the DPM1 and the slaves is divided into three phases: parameterization, configuration and data transfer. Before a DP slave is included in the data transfer phase, the DPM1 checks in the parameterization and configuration phases to see if the expected configuration corresponds to the real device configuration. This means that the device type, format and length information and the number of inputs and outputs must correspond to the actual configuration. These tests provide the user with reliable protection against parameterization errors. In addition to the user data transfer which is executed automatically by the DPM1, new parameterization data can be sent to the slaves at the request of the user.

Breite: 185 mm
Höhe: 230 mm



DA	Destination Address, 22 bits
DAT UNIT	Data field, max. 246 bytes
ED	End Delimiter, 11 bits
FC	Frame Control
FCS	Frame Check Sequence, 11 bits
LE	Length, 11 bits
LEr	Length, repeated, 11 bits
SA	Source Address
SD	Start Delimiter
SYN	Synchronization bytes

Figure 7 User Data Transmission Principle

1.2.6 **Sync and Freeze Mode** (not supported by CRP 811)

In addition to station–related user data transfer, which is executed automatically by the DPM1, the master can send control commands to a single slave, a group of slaves or all slaves simultaneously. These control commands are transmitted as Multicast functions. They are used to set the sync and freeze modes for synchronizing the DP slaves. They permit event–controlled synchronization of the slaves.

The DP slaves begin **sync mode**when they receive a sync control command from their DP master. When this happens, the outputs of all addressed slaves are frozen in their current state. During subsequent user data transmission, the output data is stored at the slaves, but the output states remain unchanged. The stored output data is sent to the outputs when the next sync control command is

received from the master. The user can end sync mode with the unsync command.

Similarly, a freeze control command causes the addressed DP slaves to assume **freeze mode**. In this operating mode the states of the inputs are frozen at their current values. The input data are not updated again until the DP master sends the next freeze command to the devices involved. Freeze mode is concluded using the unfreeze command.

1.2.7 Data Transmission between DP Master and Configuration Devices

In addition to master–slave functions, master–master communication functions are also available. They enable configuration and diagnostic devices (DPM2) to initiate the following functions via the bus as shown in the table below.

Function	Meaning	DPM1	DPM2
Get_Master_Diag	Reads the diagnostic data of the DPM1 or the diagnostic summary of the DP slaves.	P	O
Download / Upload Group (Start_Seq, Download / Upload, End_Seq)	Downloads or uploads all configuration data of a DPM1 and its associated DP slaves.	O	O
Act_Para_Brct	Activates the bus parameters simultaneously for all DPM1 devices addressed.	O	O
Act_Param	Activates parameters or changes of operating status of the DPM1 device addressed.	O	O

M = mandatory

O = optional; not supported by CRP 811.

In addition to the upload and download functions, master–master functions permit dynamic enabling or disabling of the user data transfer between the DPM1 and individual DP slaves. The operating state of the DPM1 can also be changed.

Breite: 185 mm
Höhe: 230 mm

1.2.8 Protection Mechanisms

For reasons of security, it is important to equip decentralized systems with effective protection functions against parameterization errors or failure of the transmission equipment. PROFIBUS–DP uses monitoring mechanisms at the master and at the slaves. The type of mechanism used is time monitoring. The monitoring interval is specified during configuration of the DP system.

At the DP master
The DPM1 monitors the slaves' data transmission with the Data_Control_Timer. A separate control timer is used for each slave. The time monitor reacts if no correct user data transfer occurs within the monitoring interval. The user is informed when this happens. If the automatic error reaction (Auto_Clear = True) has been enabled, the DPM1 leaves the Operate state, switches the outputs of the assigned DP slaves to fail–safe status, and changes to its Clear state.

At the DP slave
The slave uses the watchdog control to detect failures of the master or the transmission line. If no data communication with the assigned master takes place within the watchdog control interval, the slave switches its outputs to fail–safe status.

In order to ensure that only the authorized master has direct access, access protection is required for the inputs and outputs of the slaves operating in Multi–master systems. For all other DP masters, the slaves offer an image of the inputs and outputs which can be read by any master, even without access rights.

1.2.9 Device Database Files (GSD) Enable Open Configuration

PROFIBUS–DP devices have a wide range of performance characteristics that are documented in device data sheets and in device database files provided by the vendor and made available to the user. The structure, content and coding of these device database files (GSD) is standardized. This makes it easy to integrate a wide range of DP slaves with configuration devices from different vendors. The German PROFIBUS User Organization (PNO) archives the information from all vendors and will gladly provide further information concerning the GSD files.

1.2.10 Ident Number

Each DP slave and each DPM1 must have an individual ident number. The DP master requires this number in order to identify the types of devices connected without creating significant protocol overhead. The master compares the ident numbers of the devices connected with the ident numbers specified by the DPM2 in the configuration data. Transfer of user data cannot begin until the correct device types with the correct station addresses have been connected on the bus. This provides a high degree of security against configuration errors.

Manufacturers must apply to the PNO for an ident number for each DP slave and each DPM1. The PNO handles the administration of the ident numbers as well as the device database files. For further information, please contact your regional office.

Breite: 185 mm
Höhe: 230 mm

1.3 CRP 811 Functionality Master Class 1 and Performance Data

1.3.1 DP Slave Reads Diagnostic Data and Files It in State RAM

- ☐ Diagnostic data are read automatically through CRP811 by the slaves. The Quantum PLC can either be in STOP or RUN mode.
  - □ After CRP811 Power Up
  - □ After CRP811 Hot Swap
  - □ After CRP811 Reset to RS232
  - □ In the warm–up and initialization phases of the slaves
  - □ When the slave has new diagnostic data
- ☐ Configuration of diagnostic data filing in State RAM with SPU931 per slave
  - □ Filing in range 3xxxx => REGISTER Inputs
  - □ n x INT8 configurable via SPU931
  - □ n = 6 : Default value for the standard diagnosis acc. to standard
  - □ n = 1 : Minimum number of diagnostic data
  - □ n = max. Corresp. to max. number of diagnostic data per slave

Max. number and description of diagnostic data – see DP slave vendor’s user manual.

Table 1 Valid for Schneider Automation DP Slaves:

DP slave type	Max. number	Documentation Nr.
CLASSIC TIOS	13	
MOMENTUM	19	see Related Documents
DEA203	22	

□ Configuration of Diagnostic Data Filing in CRP811 with SPU931 (Buffer Resources)

Diagnostic buffer number	100 Default, 200 Max.
Bytes per buffer	32 Default, slave specifies max. with the max. number of diagnostic data (see table on page 18)

1.3.2 Send Parameterization Data to DP Slave

□ Parameterization data are sent automatically to the slaves in the warm–up and initialization phases, i.e. not when user data is being transferred

□ Defaults for bus–wide parameterization data are specified by the DP configurator and the device database files of the DP slave.

□ Defaults for DP slave–specific parameterization data from the vendor (user parameter data) are specified by the DP configurator and the device database files of the DP slave. Number and meaning of the user parameter data – see slave vendor's user manual.

1.3.3 Sending Configuration Data to the DP Slave

□ Configuration data are sent automatically to the slaves in the warm–up and initialization phases, i.e. not when user data is being transferred.

□ Defaults for configuration data are specified by the DP configurator and the device database files of the DP slave.

Breite: 185 mm
Höhe: 230 mm

1.3.4 Cyclic Transmission of Input and Output Data from State RAM

References	Dial up in SPU931
Outputs from reference 0xxxx	Boolean (see note 1)
Outputs from reference 4xxxx	Boolean (see note 2)
	Int8, Int16, Int32 (see note 2)
	RAW, String
Inputs n reference 1xxxx	Boolean (see note 1)
Inputs n reference 3xxxx	Boolean
	Int8, Int16, Int32 (see note 2)
	RAW, String (see note 2)

☞ **Note: 1:** Filing in references 0x/1x can also be carried out on 8–bit boundaries (byte boundaries)

☞ **Note: 2:** Transitions and forces with 0.xxx / 1.xxx are possible without restrictions

Table 2 Maximum number of I/O data

	Max. number of I/O data		**Max. number of slaves**	
	Max. number of I or O data per **compact** slave or per modular slave with max. **one** module.	Max. number of I or O data per **modular** slave with **more than one** module.	Max. number of compact slaves or modular slaves with max. **one** module with max. number of I or O data.	Max. number of modular slaves with **more than one** module with max. number I or O data.
CPU x 13 (1)	64 words = 128 bytes	122 words = 244 bytes	16 slaves at 128 bytes	8 slaves at 244 bytes
CPU 424 (2)	122 words = 244 bytes	122 words = 244 bytes	64 slaves at 244 bytes	64 slaves at 244 bytes

(1) Backplane transfer with max. 16 buffers at 256 bytes
(2) Backplane transfer with max. 16 buffers at 2048 bytes

1.3.5 Control Commands

The following control commands for DP slaves are **not** supported

Sync	Send outputs and freeze
Unsync	Enable outputs
Freeze	Read inputs and freeze
Unfreeze	Enable inputs
Clear	All outputs will be deleted

1.3.6 Auto–Clear

Auto–Clear = TRUE Is **not** supported	If failure occurs at one DP slave, the outputs of all other slaves are set to ”0”.
Auto–Clear = FALSE Is supported	If failure occurs at one DP slave, the outputs of all other slaves retain their settings.

Breite: 185 mm
Höhe: 230 mm

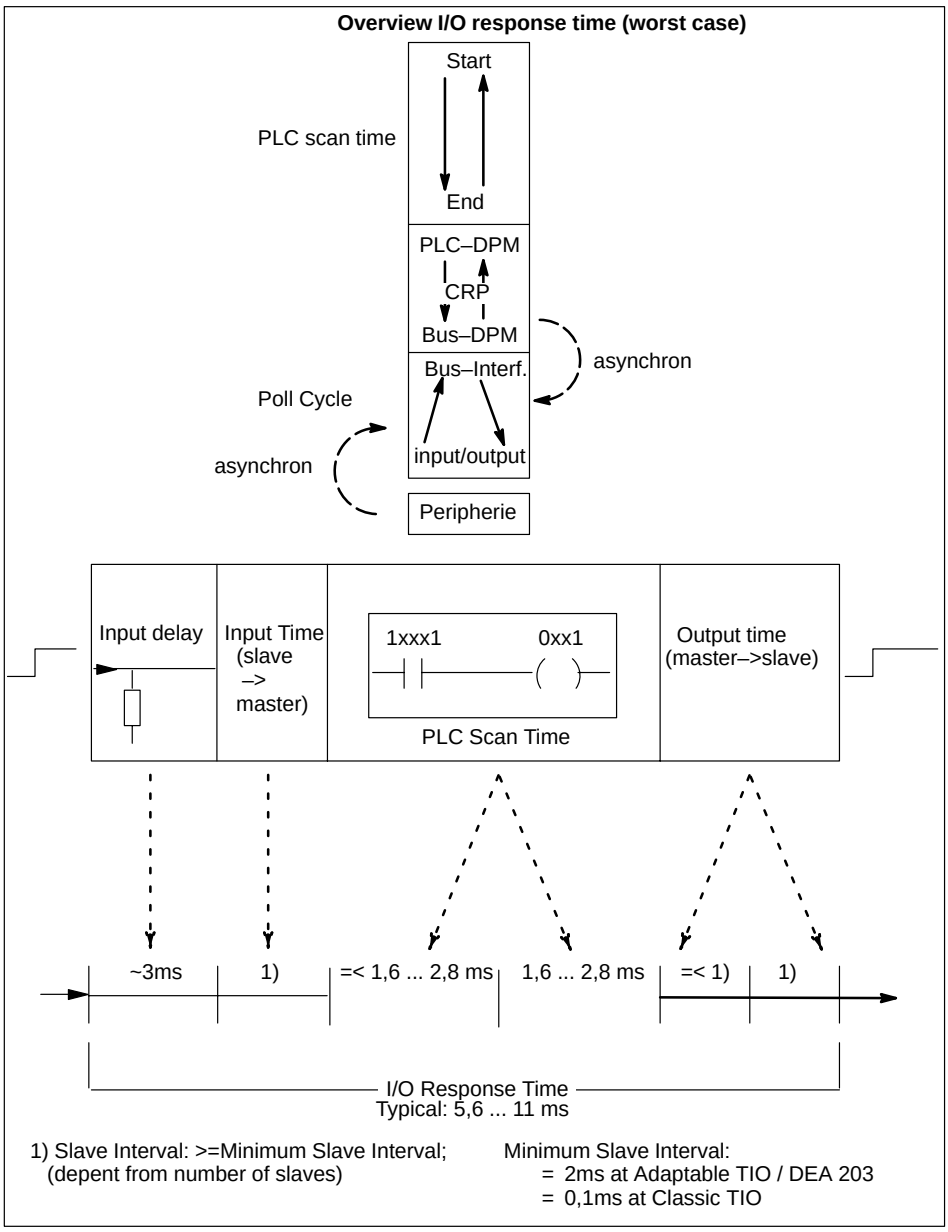
1.3.7 CRP811 Failure Behavior

Effect of setting slave output data and input data in Quantum State RAM to zero => 1xxxxx register und 3xxxxx register.

Table 3 Effect on Sign of Life Register => 3xxxxx register

			Sign of Life Register 3xxxxx		
Cases	**PROFIBUS–DP slave outputs**	**Quantum State RAM inputs 1xxxxx**	**Bit 14**	**Bit 15**	**Bit 16**
All configured DP slaves running error–free	variable	variable	flashing	flashing	flashing
One DP slave disconnected from bus	Zero 1)	Zero	flashing	0 or 1	flashing
One DP slave switched off	X	Zero	flashing	0 or 1	flashing
One DP slave failure	Zero 1)	Zero	flashing	0 or 1	flashing
All DP slaves switched off	X	Zero	0 or 1	0 or 1	flashing
All DP slaves on CRP811 disconnected from bus	Zero 1)	Zero	0 or 1	0 or 1	flashing
CRP811 disconnected from backplane	Zero 1)	Remain set	0 or 1	0 or 1	0 or 1
Firmware update to CRP811 RS232 activated	Zero	Zero	0 or 1	0 or 1	0 or 1
Reset via CRP811 RS232 after entering password	Zero 1)	Remain set	0 or 1	0 or 1	0 or 1
Quantum from PLC Start to PLC Stop	Zero	Remain set	0 or 1	0 or 1	0 or 1
Quantum switched off	Zero 1)	X	X	X	X
Quantum CPU... disconnected from backplane	Zero 1)	X	X	X	X
Quantum network unit CPS ... disconnected from backplane	Zero 1)	X	X	X	X

1) Through DP slave, X undefined if ”Watchdog Timer” activated during configuration.



Breite: 185 mm
Höhe: 230 mm

1.3.8 Performance

I/O response time between DP slave input an DP slave output with QuantumPLC:

Table 4 MOMENTUM Performance

Number of DP slaves	Words input	Words output	Typical PLC scan time	Typical I/O Response time
–1)	–	–	0,54 msec	–
1	16	4	1,7 msec	8,4 msec
2	32	8	1,8 msec	8,5 msec
3	48	12	2,0 msec	8,6 msec
4	64	16	2,2 msec	9,1 msec
5	80	20	2,3 msec	10 msec
6	96	24	2,5 msec	10,5 msec
7	112	28	2,7 msec	10,6 msec
8	128	32	2,8msec	11 msec
1) No CRP811 on the backplane				

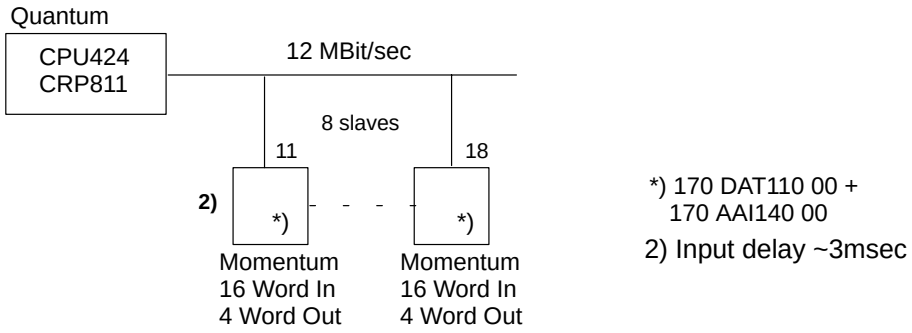


Figure 8 MOMENTUM Configuration

Note: Bus addresses without meaning (order of address, gaps)

Table 5 TIO 170 BDM344 00 Performance

"TIO" Number of DP slaves	Words input	Words output	Typical PLC scan time	Typical I/O response time
–1)	–	–	0,54 msec	–
1	1	1	1,56 msec	5,6 msec
2	2	2	1,57 msec	5,7 msec
4	4	4	1,60 msec	5,8 msec
8	8	8	1,60 msec	6,8 msec
16	16	16	1,70 msec	8,0 msec
31	31	31	1,90 msec	11,0 msec
1) No CRP811 on the backplane				

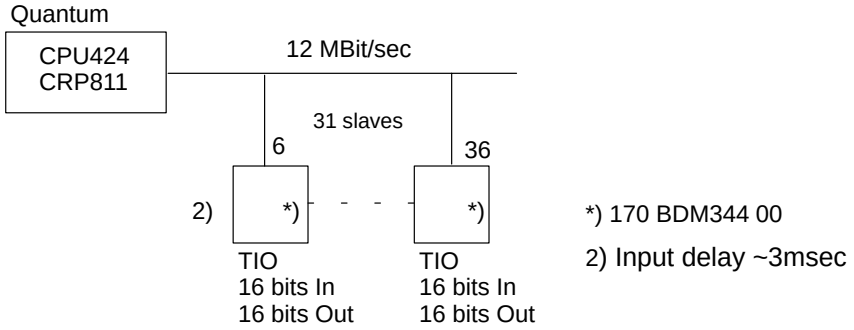


Figure 9 TIO Configuration

Note: Bus addresses without meaning (order of address, gaps)

Breite: 185 mm
Höhe: 230 mm

Table 6 Performance of modular Slave DEA203

Number of DP slaves	Words inputs	Words output	Typical PLC scan time	Typical I/O Response time
–1)			0.58 msec	–
1	18		1,71 msec	6,0 msec
2	18	18	1,76 msec	6,6 msec
3	36	18	1,89 msec	7,5 msec
4	.6	36	1,97 msec	7,7 msec
5	54	36	2,08 msec	7,9 msec
6	54	54	2,16 msec	8,3 msec
7	72	54	2,27 msec	8,7 msec
8	72	72	2,36 msec	9,8 msec
1) No CRP811 on the backplane				

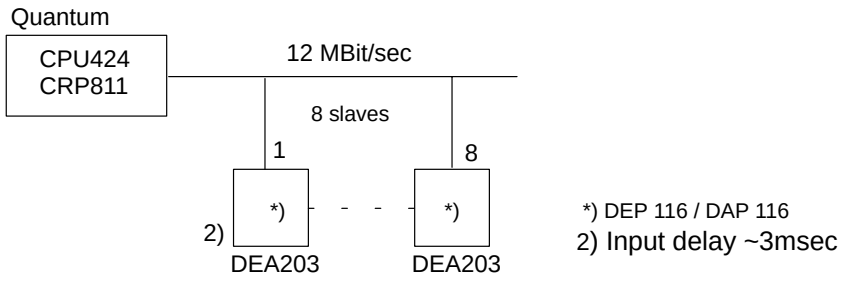


Figure 10 DEA203 Configuration

Note: Bus addresses without meaning (order of address, gaps)

1.3.9 CRP811 00 Operation in Decentralized I/O

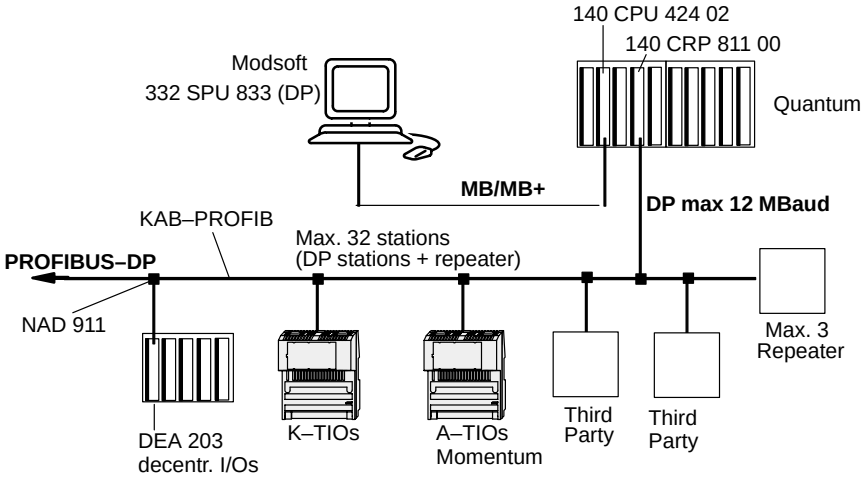
Operation of CRP in RIO (remote I/O) or DIO(distributed I/O) is **not** possible.

Chapter 2
Overview PROFIBUS-DP

Breite: 185 mm
Höhe: 230 mm

2.1 Product Overview

The following is an overview of the devices that can communicate using PROFIBUS DP.



Breite: 185 mm
Höhe: 230 mm

2.1.1 TSX–Quantum Components for PROFIBUS–DP

Table 7 Basic components

Specifications	Type / Explanation
CPU 186 —> 8 k words logical memory	140 CPU 113 02
CPU 186 —> 16 k words logical memory	140 CPU 113 02
CPU 186 —> 32/48 k words logical memory	140 CPU 213 04
CPU 486 —> 64 k words logical memory	140 CPU 424 02
PROFIBUS–DP Option Module	140 CRP 811 00
PROFIBUS–DP Configuration packet (WINDOWS 3.11/95/NT)	140 SPU 833 01 English
PROFIBUS–DP Configuration packet (WINDOWS 3.11/95)	140 SPU 833 02 German
PROFIBUS connector	140 NAD 911 02 /03 /04 /05
PROFIBUS cable	KAB PROFIB
RS232–cable for CRP811	YDL52
Ring cable clamp	
Capacitive ground terminal clamp	GND001
Number of CRP811 at 140 CPU 113 02	max. 2
Number of CRP811 at 140 CPU 213 03	max. 2
Number of CRP811 at 140 CPU 213 04	max. 2
Number of CRP811 at 140 CPU 424 02	max. 6
Slots for CRP811 on backplane	(free choice)

Table 8 Replacement parts

Performance	Type / Explanation
TAP for CRP611	490 NAE911 00
PCMCIA card for CRP811	467 NAP811 00
CRP811 ”Hot Swap” on backplane	yes
Quantum CPU ”Hot Swap” with PROFIBUS	no
Quantum CPU ”Hot Stand By” with PROFIBUS	no

2.1.2 Slave Component Assignments (PROFIBUS-DP)

Master under Modsoft	**Slaves**			**Network components**
Hardware/Software	K–TIO – I/O	DEA 203 Decentr. I/O	Momentum I/O	
DP Master hardware up to 12 MBaud: 140 CRP811 00	Compact DP Slaves up to 12 MBaud: 170 BDI344 01 170 BDI354 01 170 BDM344 01 170 BDO354 00	Modular DP slaves up to 12 MBaud: See page 32	Modular DP slaves with COM–Module: See page 33	Bus connector up to 12 MBaud: 490 NAD911 02 * 490 NAD911 03 490 NAD911 04 490 NAD911 05 –KAB–PROFIB – GND001 –Shielded cable clamp acc. toPNO (see page 59)
Software: –332 SPU 833 01 –GSD file for master	–GSD files for slaves	–GSD file for slave	–GSD files for slaves	
* = Run–out model up to 1.5 MBit/sec				

Breite: 185 mm
Höhe: 230 mm

Table 9 DEA 203 Module

Modules	Input/Output
DEP208	8 bits input
DEP209	8 bits input
DEP210	8 bits input
DEP211	8 bits input
DEP214	16 bits input
DEP215	16 bits input
DEP216	16 bits input
DEP217	16 bits input
DEP218	16 bits input
DEP220	16 bits input
DEP296	16 bits input
DEP297	16 bits input
DEO216	16 bits input
DEX216	16 bits input
DAP204	4 bits output
DAP208	8 bits output
DAP209	8 bits output
DAP210	8 bits output
DAP216	16 bits output
DAP217	16 bits output
DAP218	16 bits output
DAO216	16 bits output
DAX216	16 bits output
DAP212	8 bits input / 4 bits output
DAP220	8 bits input / 8 bits output
DAP252	8 bits input / 4 bits output
DAP253	8 bits input / 4 bits output
DAP292	8 bits input / 4 bits output
DAU202	2 Words output
DAU208	8 Words output
ADU204	5 Words input
ADU205	5 Words input
ADU206	5 Words input / 1 Byte output
ADU210	5 Words input / 4 Bytes output
ADU214	9 Words input / 8 Bytes output
ADU216	5 Words input / 1 Byte output
ZAE201	3 Words input / 11 Words output

Table 10 Adaptable TIO Module (Momentum)

Module	ID Hi/Lo	In/Out	Short description
170 ADI 350 00	0 / 1	2 / 0	32 inputs 24 VDC
170 ADI 340 00	0 / 2	1 / 0	16 inputs 24 VDC
170 ADI 640 50	0 / 3	1 / 0	16 inputs 120 VAC
170 ADI 740 50	0 / 4	1 / 0	16 inputs 240 VAC
170 ADO 340 00	0 / 5	0 / 1	16 outputs 24 VDC, 0.5A per output
170 ADO 350 00	0 / 6	0 / 2	32 outputs 24 VDC, 0.5A per output 2 power groups
170 ADO 830 50	0 / 7	0 / 1	8 outputs, 120 – 240 VAC
170 ADM 350 10 (170 ADM 350 00)	0 / 8	1 / 1	16 inputs 24 VDC 16 outputs 24 VDC, 0.5A per output 2 power groups
170 ADM 370 10	0 / 11	1 / 1	16 inputs 24 VDC 8 outputs 24 VDC, 2A per output 2 insulation groups
170 ADM 390 10	0 / 12	3 / 1	16 inputs 24 VDC monitored 12 outputs 24 VDC, 0.5A per output 2 power groups
170 ADM 390 30	0 / 10	1 / 1	10 inputs 24 VDC 8 outputs 24 VDC, 1 relay per output 2 Insulation groups
170 ADM 690 50	0 / 9	1 / 1	10 inputs 120 VAC 8 outputs 120 VAC, 0.5A per output 2 power groups
170 AAI 030 00	2 / 192	8 / 2	8 Differential channels
170 AAI 140 00	04 / 193	16 / 4	16 Individual channels
170 AAI 520 40	02 / 194	4 / 2	4 Differential channels
170 AAO 120 00	1 / 195	0 / 5	4 Output channels
170 AMM 090 00	02 / 224	5 / 5	analog: 4 inputs + 2 outputs digital: 4 inputs + 2 outputs24 VDC, 1A
170 AEC 920 00	0 / 160	8 / 8	High–speed counter
170 AEG 910 90	0 / 128	8 / 8	Stepping motor controller

Breite: 185 mm
Höhe: 230 mm

2.2 TIO and Compact Slave Assignment Tables

This section describes the data presentation between some typical DP Slave Modules TIO/DEA 203 and Quantum State RAM using the Option Board CRP 811.

2.2.1 BDO 354 – Digital output / 32 bits, 24 VDC

out / in	State RAM Addresses	State RAM Data MSB 1 8	LSB 9 16	D–Type	CRP811 I/O Data	CRP811 State RAM	Module 1 8 17 24	9 16 25 32
out	000001 –16 000017 –32	10000100 10100110	11000010 11100001	Bool	21 43 65 87	1–32 (*)	10000100 10100110	11000010 11100001
out	400001 400002	10000100 10100110	11000010 11100001	Bool	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
out	400001 400002 400003 400004	00000000 00000000 00000000 00000000	10000100 11000010 10100110 11100001	uint8	84 C2 A6 E1	1–4 (*)	00100001 01100101	01000011 10000111
out	400001 400002 400003 400004	00000000 00000000 00000000 00000000	10000100 11000010 10100110 11100001	int8	84 C2 A6 E1	1–4 (*)	00100001 01100101	01000011 10000111
out	400001 400002	10000100 10000100	11000010 11100001	uint16	84 C2 A6 E1	1–2 (*)	00100001 01100101	01000011 10000111
out	400001 400002	10000100 10100110	11000010 11100001	int16	84 C2 A6 E1	1–2 (*)	00100001 01100101	01000011 10000111
out	400001 400002	10000100 10100110	11000010 11100001	uint32	84 C2 A6 E1	1–2 (*)	00100001 01100101	01000011 10000111
out	400001 400002	10000100 10100110	11000010 11100001	int32	84 C2 A6 E1	1–2 (*)	00100001 01100101	01000011 10000111
out	400001 400002	10000100 10100110	11000010 11100001	raw	C2 84 E1 A6	1–2 (*)	01000011 10000111	00100001 01100101
out	400001 400002	10000100 10100110	11000010 11100001	string	84 C2 A6 E1	1–2 (*)	00100001 01100101	01000011 10000111

(*) These entries correspond to the State RAM addresses in column 2.

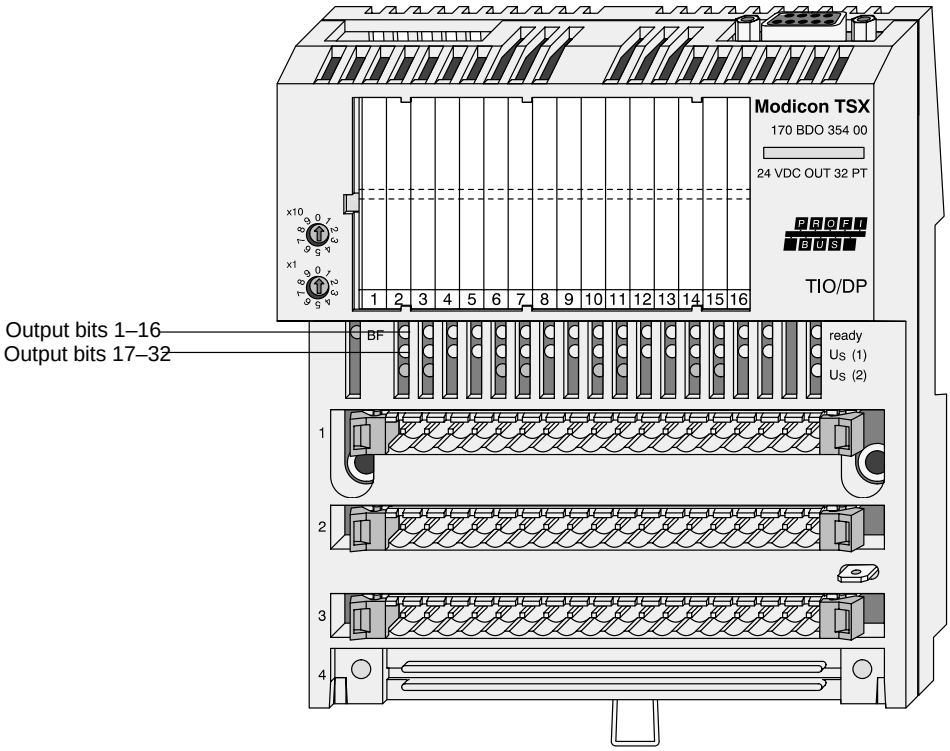


Figure 11 170 BDO 354 00

Breite: 185 mm
Höhe: 230 mm

2.2.2 BDI 354 – Digital input / 32 bits, 24VDC

out / in	State RAM Addresses	State RAM Data MSB 1 8	LSB 9 16	D–Type	CRP811 I/O Data	CRP811 State RAM	Module 1 8 17 24	9 16 25 32
in	100001 –16 100017 –32	10000100 10100110	11000010 11100001	Bool	21 43 65 87	1–32 (*)	10000100 10100110	11000010 11100001
in	300001 300002	10000100 10100110	11000010 11100001	Bool	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
in	300001 300002 300003 300004	00000000 00000000 00000000 00000000	00100001 01000011 01100101 10000111	uint8	21 43 65 87	1–4 (*)	10000100 10100110	11000010 11100001
in	300001 300002 300003 300004	00000000 00000000 00000000 11111111	00100001 01000011 01100101 10000111	int8	21 43 65 87	1–4 (*)	10000100 10100110	11000010 11100001
in	300001 300002 300003 300004	11111111 11111111 11111111 11111111	10100001 11000011 11100101 10000111	int8	A1 C3 E5 87	1–4 (*)	10000101 10100111	11000011 11100001
in	300001 300002	00100001 01100101	01000011 10000111	uint16	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
in	300001 300002	00100001 01100101	01000011 10000111	int16	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
in	300001 300002	00100001 01100101	01000011 10000111	uint32	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
in	300001 300002	00100001 01100101	01000011 10000111	int32	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
in	300001 300002	01000011 10000111	00100001 01100101	raw	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001
in	300001 300002	00100001 01100101	01000011 10000111	string	21 43 65 87	1–2 (*)	10000100 10100110	11000010 11100001

(*) These entries correspond to the State RAM Addresses in column 2.

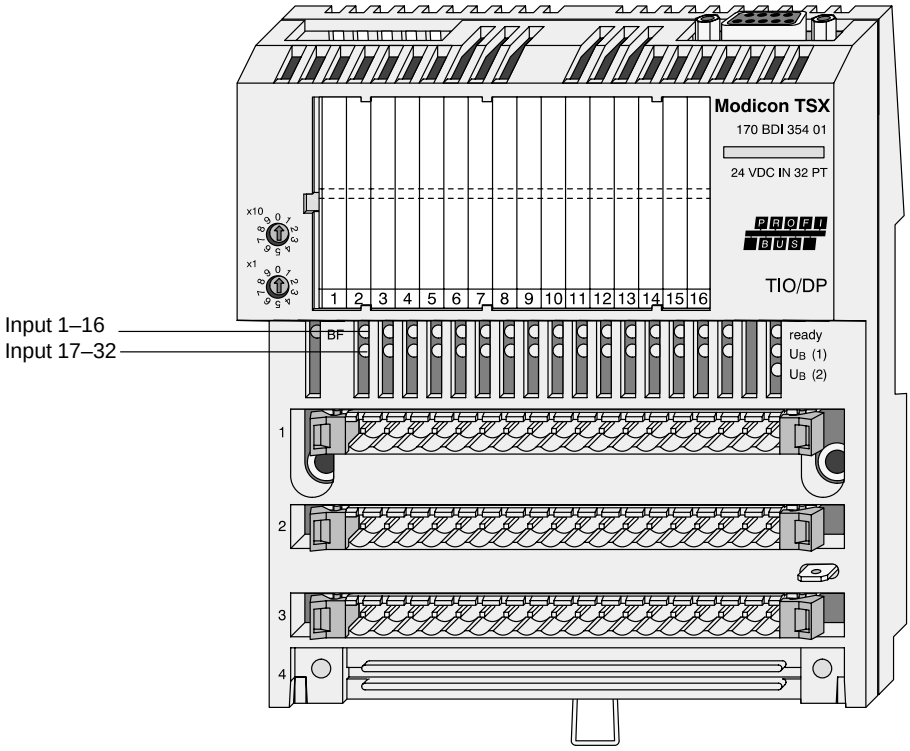


Figure 12 170 BDI 354 00

Breite: 185 mm
Höhe: 230 mm

2.2.3 BDM 344 – Digital input and output / per 16 bits, 24 VDC

out / in	State RAM Addresses	State RAM Data MSB 1 8	LSB 9 16	D–Type	CRP811 I/O Data	CRP811 State RAM	Module 1 8	9 16
out	000001 –16	10000100	11000010	Bool	21 43	1–16 (*)	10000100	11000010
in	100001 –16	10000100	11000010	Bool	21 43	1–16 (*)	10000100	11000010
out	400001	10000100	11000010	Bool	21 43	1 (*)	10000100	11000010
in	300001	10000100	11000010	Bool	21 43	1 (*)	10000100	11000010
out	400001 400002	00000000 00000000	10000100 11000010	uint8	84 C2	1–2 (*)	00100001	01000011
in	300001 300002	00000000 00000000	00100001 01000011	uint8	21 43	1–2 (*)	10000100	11000010
out	400001 400002	00000000 00000000	10000100 11000010	int8	84 C2	1–2 (*)	00100001	01000011
in	300001 300002	00000000 00000000	00100001 01000011	int8	21 43	1–2 (*)	10000100	11000010
in	300001 300002	111111111 111111111	10100001 11000011	int8	A1 C3	1–2 (*)	10000101	11000011
out	400001	10000100	11000010	uint16	84 C2	1 (*)	00100001	01000011
in	300001	00100001	01000011	uint16	21 43	1 (*)	10000100	11000010
out	400001	10000100	11000010	int16	84 C2	1 (*)	00100001	01000011
in	300001	00100001	01000011	int16	21 43	1 (*)	10000100	11000010
out	400001 400002	10000100 00000000	11000010 00000000	uint32	84 C2 00 00	1–2 (*)	00100001	01000011 (**)
in	300001 300002	00100001 00000000	01000011 00000000	uint32	21 43 00 00	1–2 (*)	10000100	11000010 (**)
out	400001 400002	10000100 00000000	11000010 00000000	int32	84 C2 00 00	1–2 (*)	00100001	01000011 (**)
in	300001 300002	00100001 00000000	01000011 00000000	int32	21 43 00 00	1–2 (*)	10000100	11000010 (**)
out	400001	10000100	11000010	raw	C2 84	1 (*)	01000011	00100001
in	300001	01000011	00100001	raw	21 43	1 (*)	10000100	11000010
out	400001	10000100	11000010	string	84 C2	1 (*)	00100001	01000011
in	300001	00100001	01000011	string	21 43	1 (*)	10000100	11000010

(*) These entries correspond to the State RAM Addresses in column 2.
(**) Prohibited, register 2 is incorrect.

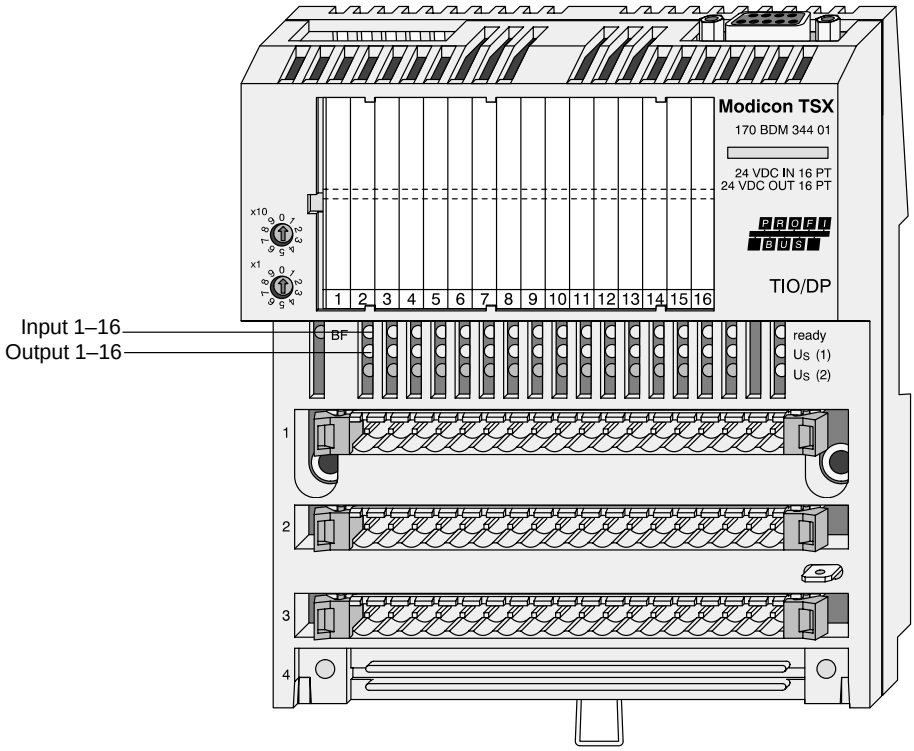


Figure 13 170 BDM 344 00

Breite: 185 mm
Höhe: 230 mm

2.2.4 DAP 204 – Digital output / 4 bits, 24 VDC

out / in	State RAM Addresses	State RAM Data MSB 1 8	LSB 9 16	D–Type	CRP811 I/O Data	CRP811 State RAM	Module 1 4 Output
out	000001 –16	10000100	00000000	Bool	21	1–4 (*)	1000
out	400001	10000100	00000000	Bool	21	1 (*)	1000
out	400001	00000000	11000010	uint8	84	1 (*)	0010
out	400001	00000000	11000010	int8	84	1 (*)	0010
out	400001	10000100	00000000	uint16	84 00	1 (*)	0010 (**)
out	400001	10000100	00000000	int16	84 00	1 (*)	0010 (**)
out	400001 400002	10000100 00000000	00000000 00000000	uint32	84 00 00 00	1–2 (*)	0010 (**)
out	400001 400002	10000100 00000000	00000000 00000000	int32	84 00 00 00	1–2 (*)	0010 (**)
out	400001	00000000	10000100	raw	84	1 (*)	0010
out	400001	10000100	00000000	string	84	1 (*)	0010

(*) These entries correspond to the State RAM addresses in column 2.
(**) Only bits 1–8 valid in register 1

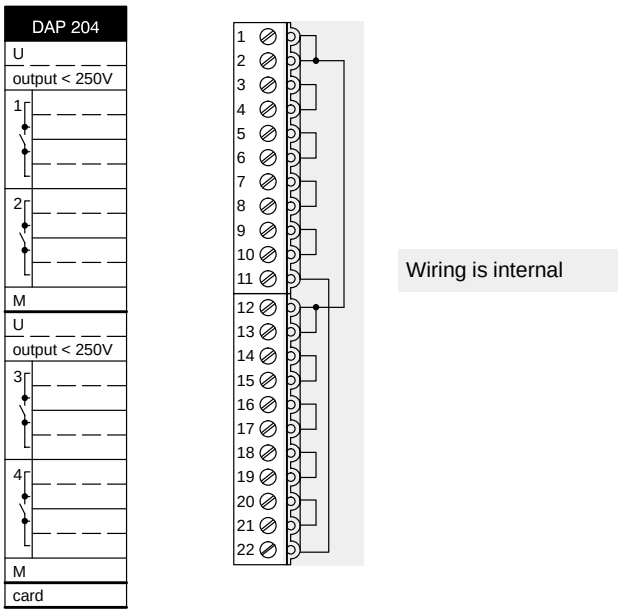


Figure 14 ASABDAP204 (244676)

2.2.5 DAP216 – Digital output / 16 bits, 24VDC

out / in	State RAM Addresses	State RAM Data MSB 1 8	LSB 9 16	D–Type	CRP811 I/O Data	CRP811 State RAM	Module 1 8 17 24	9 16 25 32
out	000001 –16	10000100	11000010	Bool	43 21	1–16 (*)	10000100	11000010
out	400001	10000100	11000010	Bool	43 21	1 (*)	10000100	11000010
out	400001 400002	00000000 00000000	10000100 11000010	uint8	84 C2	1–2 (*)	01000011	00100001
out	400001 400002	00000000 00000000	10000100 11000010	int8	84 C2	1–2 (*)	01000011	00100001
out	400001	10000100	11000010	uint16	84 C2	1 (*)	01000011	00100001
out	400001	10000100	11000010	int16	84 C2	1 (*)	01000011	00100001
out	400001 400002	10000100 00000000	11000010 00000000	uint32	84 C2 00 00	1–2 (*)	01000011	00100001 (**)
out	400001 400002	10000100 00000000	11000010 00000000	int32	84 C2 00 00	1–2 (*)	01000011	00100001 (**)
out	400001	10000100	11000010	raw	C2 84	1 (*)	00100001	01000011
out	400001	10000100	11000010	string	84 C2	1 (*)	01000011	00100001

(*) These entries correspond to the State RAM Addresses in column 2.
(**) Prohibited, register 2 is incorrect

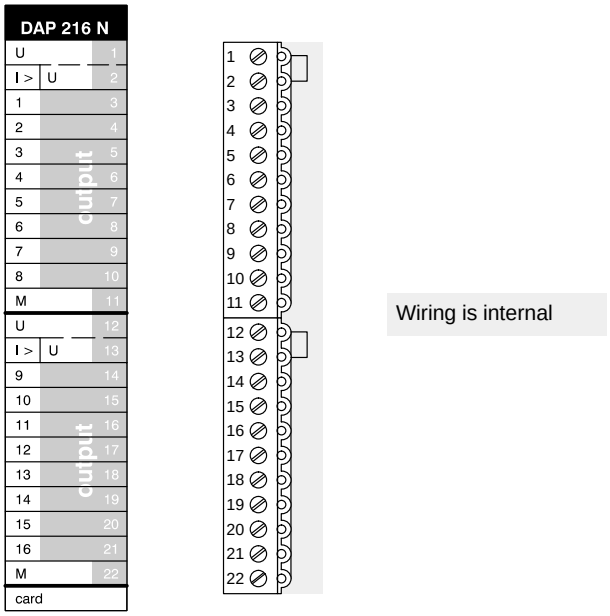


Figure 15 ASABDAP2160 (270385)

Breite: 185 mm
Höhe: 230 mm

2.2.6 DAP 220 – Digital input and output / per 8 bits, 24VDC

out / in	State RAM Addresses	State RAM Data MSB 1 8	LSB 9 16	D–Type	CRP811 I/O Data	CRP811 State RAM	Module 1 8 output	1 8 input
out	000001 –16	10000100	00000000	Bool	21	1–8 (*)	10000100	
in	100001 –16	10000100	00000000	Bool	21	1–8 (*)		10000100
out	400001	10000100	00000000	Bool	21	1 (*)	10000100	
in	300001	10000100	00000000	Bool	21	1 (*)		10000100
out	400001	00000000	10000100	uint8	84	1 (*)	00100001	
in	300001	00000000	00100001	uint8	21	1 (*)		10000100
out	400001	00000000	10000100	int8	84	1 (*)	00100001	
in	300001	00000000	00100001	int8	21	1 (*)		10000100
in	300001	111111111	10100001	int8	A1	1 (*)		10000101
out	400001	10000100	00000000	uint16	84 00	1 (*)	00100001 (**)	
in	300001	00100001	00000000	uint16	21 00	1 (*)		10000100 (**)
out	400001	10000100	00000000	int16	84 00	1 (*)	00100001 (**)	
in	300001	00100001	00000000	int16	21 00	1 (*)		10000100 (**)
out	400001 400002	10000100 00000000	00000000 00000000	uint32	84 00 00 00	1–2 (*)	00100001 (**)	
in	300001 300002	00100001 00000000	00000000 00000000	uint32	21 00 00 00	1–2 (*)		10000100 (**)
out	400001 400002	10000100 00000000	00000000 00000000	int32	84 00 00 00	1–2 (*)	00100001 (**)	
in	300001 300002	00100001 00000000	00000000 00000000	int32	21 00 00 00	1–2 (*)		10000100 (**)
out	400001	10000100	10000100	raw	84	1 (*)	01000011	
in	300001	01000011	00100001	raw	21	1 (*)		10000100
out	400001	10000100	00000000	string	84	1 (*)	00100001	
in	300001	00100001	00000000	string	21	1 (*)		10000100

(*) These entries correspond to the State RAM Addresses in column 2.
(**) Only bits 1–8 valid in register 1

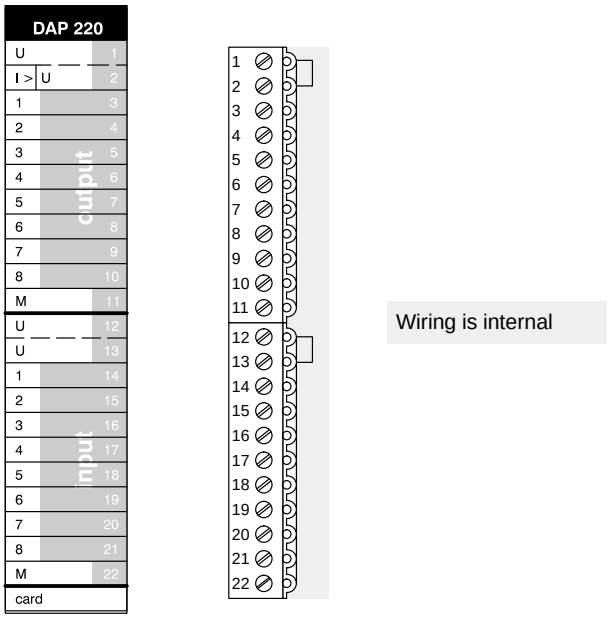


Figure 16 ASBDAP220 (272555)

Breite: 185 mm
Höhe: 230 mm

2.2.7 DEP216 – Digital input / 16 bits, 24VDC

out / in	State RAM Addresses	State RAM Data MSB 1 8	LSB 9 16	D–Type	CRP811 I/O Data	CRP811 State RAM	Module 1 8	9 16
in	100001 –16	10000100	11000010	Bool	43 21	1–16 (*)	10000100	11000010
in	300001	10000100	11000010	Bool	43 21	1 (*)	10000100	11000010
in	300001 300002	00000000 00000000	01000011 00100001	uint8	43 21	1–2 (*)	10000100	11000010
in	300001 300002	00000000 00000000	01000011 00100001	int8	43 21	1–2 (*)	10000100	11000010
in	300001 300002	11111111 11111111	11000011 10100001	int8	C3 A1	1–2 (*)	10000101	11000011
in	300001	01000011	00100001	uint16	43 21	1 (*)	10000100	11000010
in	300001	01000011	00100001	int16	43 21	1 (*)	10000100	11000010
in	300001 300002	01000011 00000000	00100001 00000000	uint32	43 21 00 00	1–2 (*)	10000100	11000010 (**)
in	300001 300002	01000011 00000000	00100001 00000000	int32	43 21 00 00	1–2 (*)	10000100	11000010 (**)
in	300001	00100001	01000011	raw	43 21	1 (*)	10000100	11000010
in	300001	01000011	00100001	string	43 21	1 (*)	10000100	11000010

(*) These entries correspond to the State RAM Addresses in column 2.
(**) Prohibited, register 2 is incorrect

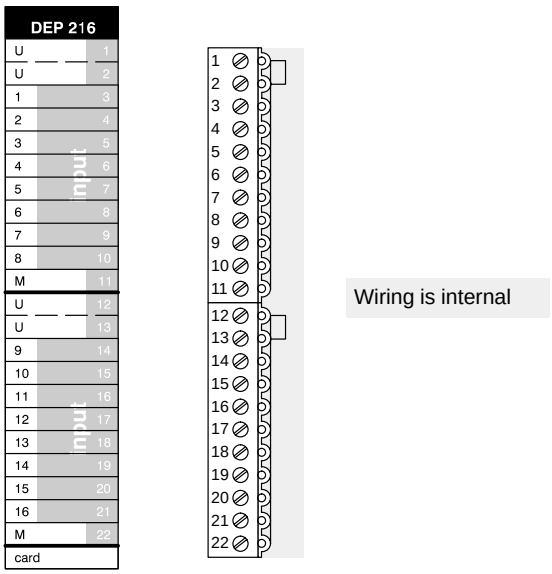


Figure 17 ASBDEP216 (244630)

Breite: 185 mm
Höhe: 230 mm

Chapter 3
Installation Guide (Hardware)

This documentation descript the standard for installation of new controls and equipments.

The basis of the description are the installation guides of the Profibus User organisation (PNO). You can buy them at PROFIBUS Nutzerorganisation e.V., Hard– und Neu–Str. 7, D–76131 Karlsruhe.

Breite: 185 mm
Höhe: 230 mm

3.1 General Information on Installing PROFIBUS

PROFIBUS-DP is a serial field bus. This bus represents an open network according to the EN 50170 standard, section 2. For PROFIBUS cable connections, only shielded twisted pair cables may be used.

☞ **Note:** The following specifications are mandatory. This refers in particular to the installation and the use of field devices.

☞ **Note:** In addition to these specifications, the technical guidelines by the single manufacturers and vendors must be observed.

In all cases make sure to observe the German PROFIBUS User Organization (PNO) Installation Guidelines (Order No. 2.111).

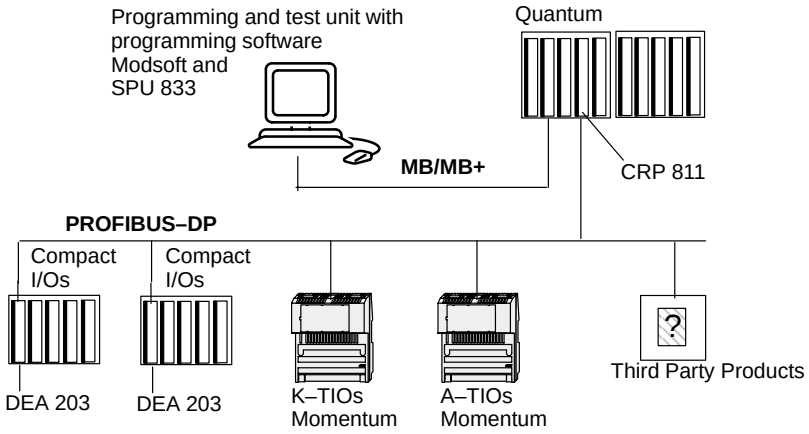
3.1.1 Specific PROFIBUS–DP Requirements for Quantum/Modsoft

A maximum of 1 bus master is allowed for a PROFIBUS–DP network.

Number of field devices allowed in one segment:	max. 32 stations, not more than 1 active PU
predefined bus transfer rate:	>= 9.6 kBaud / up to 12 MBaud
total length of bus lines in one segment:	see Table 11 on page 52
Number of segments	max. 4, with a maximum of 3 repeaters

Breite: 185 mm
Höhe: 230 mm

3.1.2 Network sample of PROFIBUS DP with Quantum, Compact, TIOs and Third Party products



Hardware components for PROFIBUS DP
– Master for Quantum:
140 CRP 811 00
–Slaves:
for AS–BDEA 203 with Compact periphery
Classic TIO components
Adaptable TIO components (Momentum)

Software components for PROFIBUS DP
– Configuration software: 332 SPU 833 01
– Modsoft >=V2.51

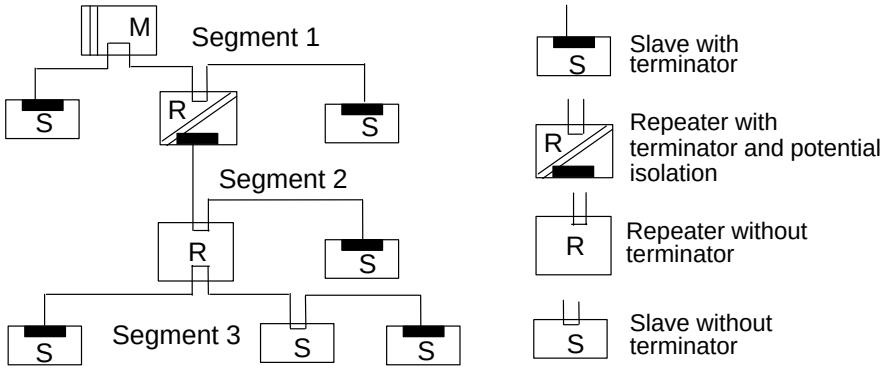
Figure 18 PROFIBUS–DP Network

3.1.3 Configuration Limits

See Appendix A, page NO TAG Module Description CRP 811 ”Technical Specifications”.

See Chapter 1.3 on page 18 ”CRP811 – Master Class 1 Functionality and Performance Specifications.

3.1.4 Segmentation Sample of a PROFIBUS System with Repeaters



Repeaters located at the beginning or at the end of a segment have to be terminated. For further information see page 62.

Breite: 185 mm
Höhe: 230 mm

3.1.5 Methods of Cabling and Bus Design for PROFIBUS DP

Table 11 Transmission equipment

Bus length per segment	Transfer rates for cable Type A up to 12 MBaud
max. 1.2 km	9.6 kBaud
max. 1.2 km	19.2 kBaud
max. 1.2 km	93.75 kBaud
max. 1.0 km	187.5 kBaud
max. 0.4 km	500 kBaud
max. 0.2 km	1.5 MBaud
max. 0.1 km	3 MBaud
max. 0.1 km	6 MBaud
max. 0.1 km	12MBaud
Line redundancy	no

Bus cable type (yard good)	twisted pair, shielded PROFIBUS cable type ”A” up to 12 MBaud, rigid
Connection interface	acc. to EIA RS 485
Bus connector (with / without terminator	acc. to standard 390 / 220 / 390 Ohms See Chapter 3.3.2 on page 69
Stub cables	none (except for diagnostic purposes: 1 X 3 m to bus monitor)

Table 12 Bus technology

Station type	Master Class 1
Bus access method	Master / slave to DP–Slave
Transfer mode	half–duplex
Length of telegram	max. 255 Bytes
Data field length	max. 244 Bytes
Data security	Hamming distance HD = 4
Bus addresses	1 126
FDL service SRD	for slave parameterization, configuration, diagnostics, and user data transmission

3.2 Regulations for Installation

3.2.1 Bus Segment Installation

As a basic rule of cable layout, the bus cable must not be twisted, stretched, or squeezed/pinched.

Each bus segment must be terminated on both ends using a terminator. The segment is not terminated if, for example, the last slave which carries a bus termination connector remains without voltage. Since the bus termination connector receives its voltage signal from the station, the terminator remains ineffective. If the bus cable is looped through, the bus connector may always be pulled off the bus interface of a device without interrupting bus data traffic.

☞ **Note:** Make sure that all devices with an activated terminator have a steady voltage supply during operation and in the warm–up phase.

3.2.2 Cabinet Line Layout

For cabinet cabling, the system's resistance to jamming greatly depends upon the line layout inside the cabinet. Shielded data lines (for PROFIBUS–DP, PG, etc.) must be separated from all cables carrying direct or alternating current of more than 60 Volts. Also, cables for direct or alternating current between 60 and 230 Volts must be separated from cables carrying voltages above 230 Volts. Separation criteria are met if the lines are laid out in separate cable ducts or if separate trunk groups are used. Signal lines and power cables must be laid out at a minimum distance of 20 centimeters. This regulation must be strictly observed with respect to the voltage supply of electronic devices, such as PROFIBUS slaves, I/O modules, controllers, etc.

Inside the cabinet, the shield of the PROFIBUS–DP data line must be laid out on a shield neutralization rail. The shield must then be continued to the module and installed according to the regulations above. PG screw connections with integrated ground terminal are not allowed. Stub cables are not allowed for PROFIBUS network installations.

Breite: 185 mm
Höhe: 230 mm

3.2.3 Line Layout Outside Cabinets

Lines outside cabinets should generally be laid out on metal ducts. Only lines with voltages below 60 Volts or shielded lines with voltages below 230 Volts may be laid out on the same ducts (flat duct, vat, groove, or pipe). Lines with voltages above 230 Volts must be laid out separately. On metal ducts, fins may be used for separation. However, the minimum distance of 20 centimeters must always be respected.

☞ **Note:** PROFIBUS data lines always must be laid out on separate metal cable ducts. Only communication lines may be laid out on the same ducts (flat duct, vat, groove, or pipe). If a bus line is laid out on cable vats or flat ducts, these ducts must be connected to a continuous chain and connected to ground terminal. This regulation also applies to short stub cable vats.

3.2.4 Trailing Lines

The trailing line must be inserted into the drag chain or holding device twist–free. The trailing line must not be lifted off the roll in loops. In the drag chain, the trailing line must either be laid out next to lines with voltages of up to 60 Volts, or duct fins must be used, if present. The trailing line must be free to move in the drag chain. The trailing line must be fastened over a large surface to the fixed point and to the catch using appropriate cable cleats.

☞ **Note:** Make sure that the trailing line is unable to move inside the fixed point and that the leads of the cable are not pinched.

☞ **Note:** The trailing line may not be used in catenary suspension. Bend radius must not be below 15 x cable diameter.

3.2.5 Outdoor Line Layout

For outdoor line layout make sure to use cables suitable for underground installation.

In general, the same recommendations apply to both outdoor and indoor layout. For outdoor installation, cables should additionally be laid out inside an appropriate plastic pipe. For underground installation, only underground cables may be used. Make sure to take into account the temperatures the cable will be exposed to. For outdoor to indoor transitions always use a terminal box. The task of a terminal box is to ensure an appropriate transition from underground cable to standard bus cable. In addition, a terminal box contains a protective circuit with surge protection (lightning protection).

☞ **Note:** For transfer rates above 500 kBauds it is recommended to use suitable optical fiber cables for cable layout between buildings.

3.2.5.1 Surge protection for Bus Lines up to 500 kBaud (outdoor)

In order to protect communication devices from surges (lightning) it is recommended to provide long distance lines with surge protection (lightning arrestors). The minimum nominal discharge current should be 5 kA, e.g. type ARE Order No. 919 232, Manufacturer:

Dehn und Söhne
Postfach
92306 Neumarkt 1

Protection of a PROFIBUS cable requires two ARE lightning arrestors for each building.

Breite: 185 mm
Höhe: 230 mm

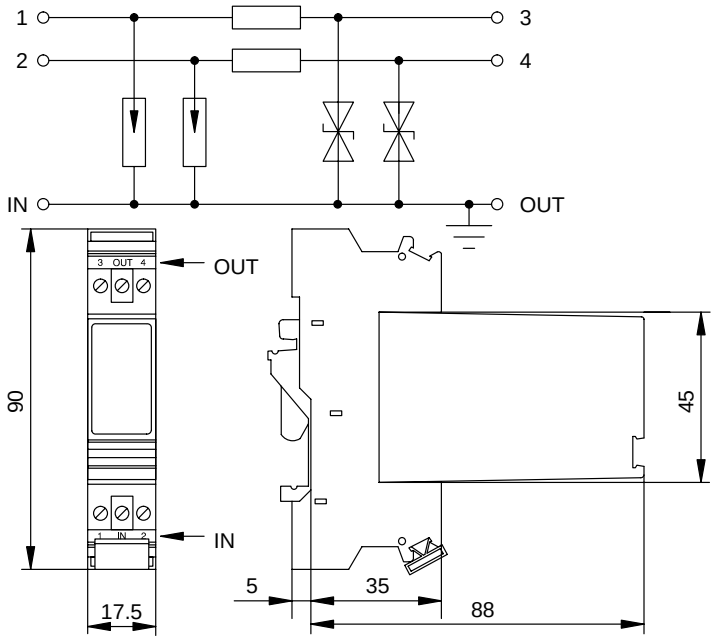
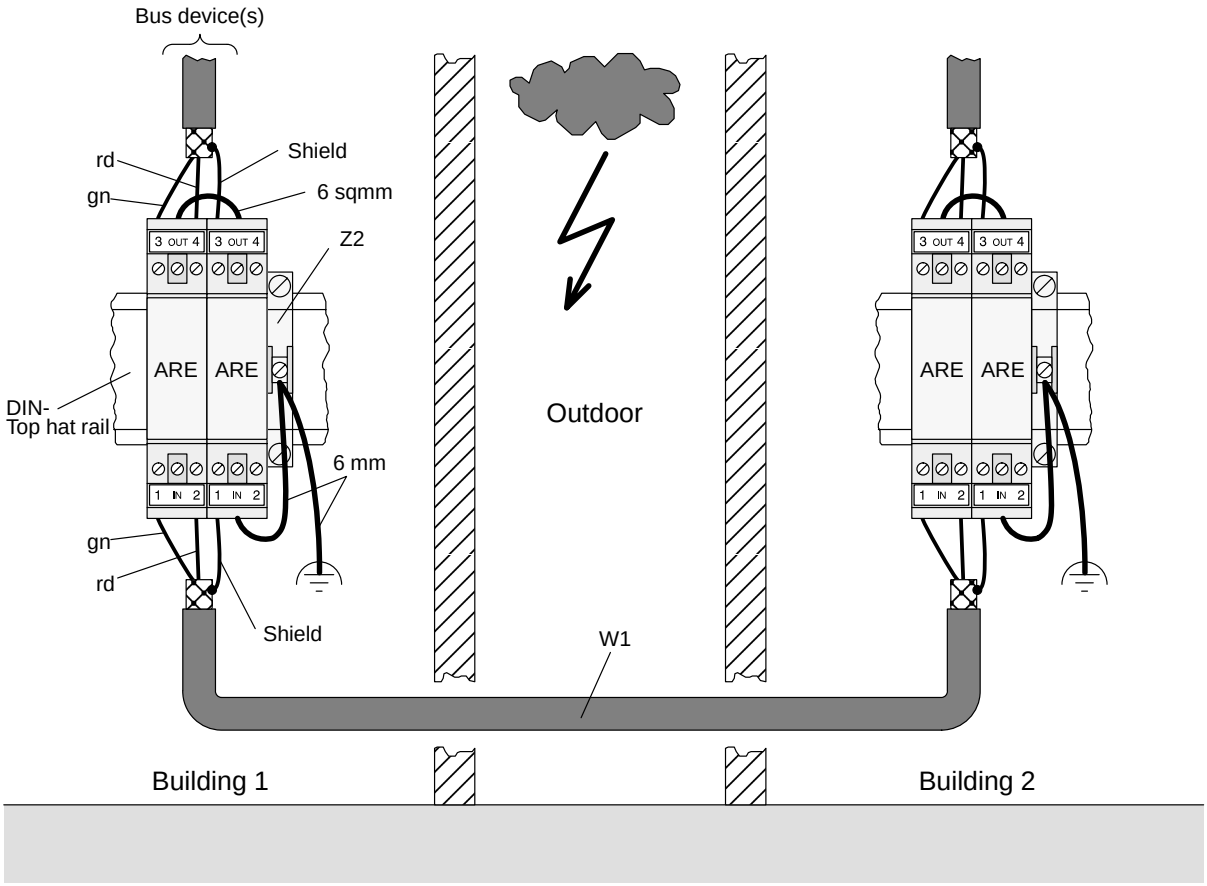


Figure 19 Connection Diagram and Technical Specifications of ARE Lightning Arrestor



W1 PROFIBUS cable KAB PROFIB
Z2 Ground terminal cleat EDS 000

Figure 20 Terminal Diagram of ARE Lightning Arrestor

Be sure to meet the following requirements:

- ☐ Do **not** switch the red and green leads at the transition point.
- ☐ Do **not** switch the IN and OUT sides of the ARE (IN = outdoor)
- ☐ Install a functional ground terminal (potential–equalization rod).
- ☐ Mount the lightning arrestors in the vicinity of the functional ground, so that the surge current can be derived to the building ground over the shortest possible distance.
  Keep the line (minimum diameter 6 sqmm) leading to functional ground as short as possible.
- ☐ A cable pair of a loom of PROFIBUS cables may be connected to a maximum of 10 lightning arrestors in series, i.e. there is a maximum of 5 outdoor line segments.

Breite: 185 mm
Höhe: 230 mm

3.2.5.2 Surge protection for Bus Lines over 500 kBaud to 1.5MBaud (outdoor) with optical fiber cables

3.2.5.3 Additional Notes

☞ **Note:** For additional notes on installation see Installation Instructions, PNO No.: 2.111

☞ **Note:** In case electronic speed regulators are used, be sure to respect the manufacturer's EMC guidelines. These guidelines contain information on the correct use of filters, chokes, and shieldings.

⚠ **Caution: For illumination of control cabinets always use lamps without starters or with EMC–compliant starters.**

3.2.6 Grounding, Potential Equalization and Shielding

3.2.6.1 Grounding and Shielding of Systems with Potential Equalization

In order to ensure maximum electromagnetic compatibility, the bus shieldings should form a continuous envelope and be connected to the metal cases of the connected bus devices, if possible. Since this system design requires multiple grounding of the bus cable shielding, correct potential equalization is very important.

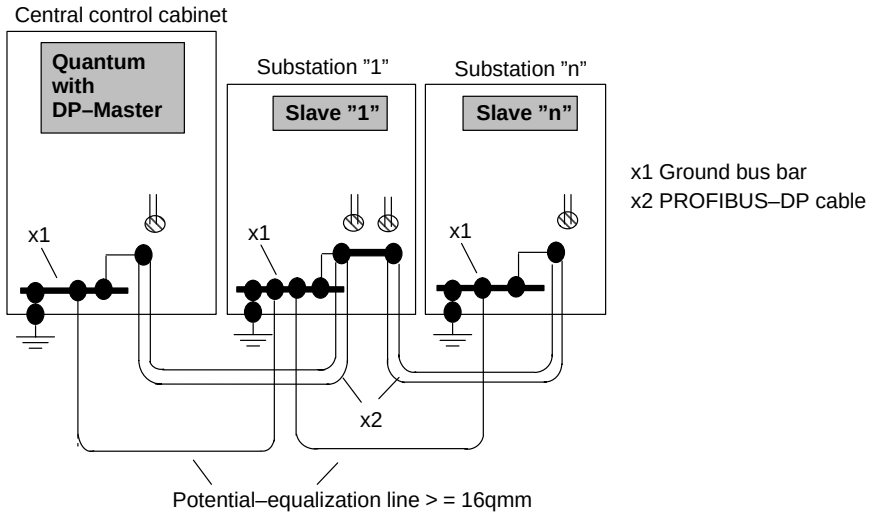


Figure 21 Grounding with Potential Equalization

Grounding / potential equalization
Due to ground potential fluctuations, an equalizing current may occur over shieldings which are connected on both ends. In order to prevent this, potential equalization is absolutely necessary for all connected system components and devices. For this purpose, and in order to achieve maximum EMC, all system components (machine, cabinets, external control panels, devices, etc.) must be sufficiently grounded over a large surface and connected to the ground bus bar (FE/PE) of the central cabinet over a minimum cable diameter of 16 sqmm.

Shielding
The braided shielding and foil shielding of the bus cable serves to improve electromagnetic compatibility (EMC). The braided shielding and the foil shielding underneath it must be grounded on both sides and with good conduction using metal structures with large surfaces. When stripping the insulation, make sure not to damage the braided shielding.

☞ **Note:** Upon entering the control cabinet, the braided shielding of the bus cable must be directly inserted into a shield bar.

☞ **Note:** The shield bar must be connected to cabinet ground over a large and conductive surface (no varnished surfaces).

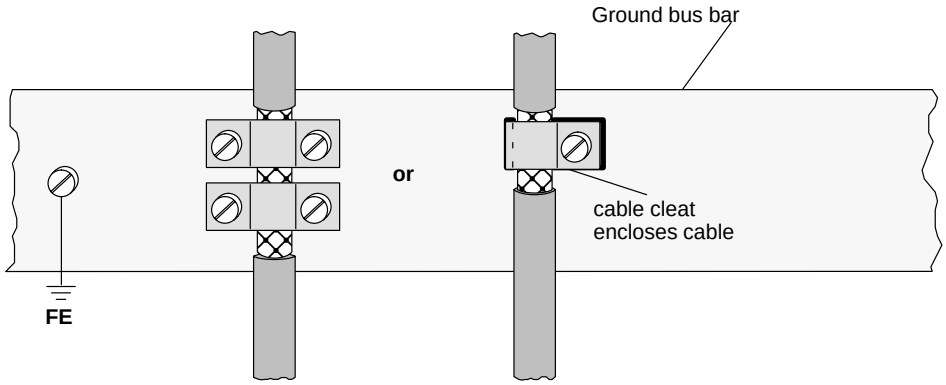


Figure 22 Shield connection for PROFIBUS acc. to PNO

Breite: 185 mm
Höhe: 230 mm

3.2.6.2 Grounding and Shielding of Systems without Potential Equalization

In case of particular system configurations (e.g., separate halls / buildings) which do not allow potential equalization to a central ground point in the control cabinet, the following grounding and shielding technique may be applied. However, this method is not as effective as the measures described under 3.2.6.1 ff. and should therefore be considered a backup solution.

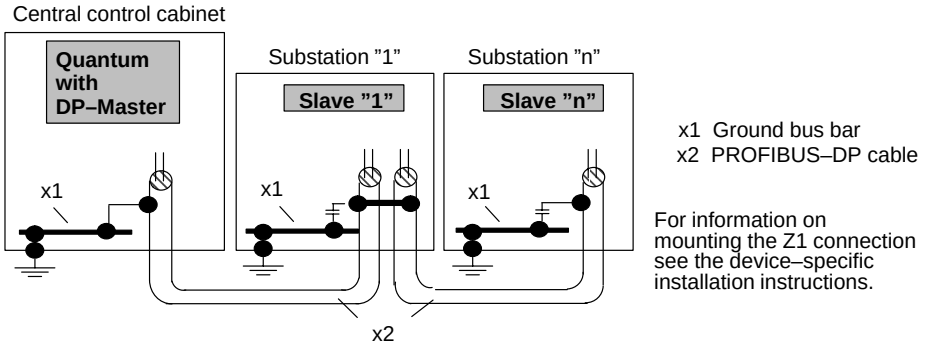


Figure 23 Decentralized Grounding Measures

In this case, the bus cable shield is only grounded on one side (in the central control cabinet), over a large surface and electronically, as described in 3.2.6.2. From there to the last bus device, the shield must be laid out continually and without further electronic ground connection. All bus devices require capacitive grounding of the shield in order to derive interfering high–frequency signals. See the following grounding method using the capacitive grounding clamp GND 001.

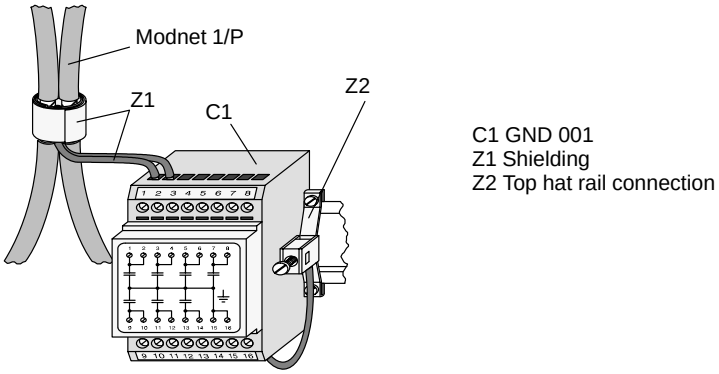


Figure 24 Example of Connecting the Capacitive Grounding Clamp GND 001

When installing the shielding connection for grounding clamp connection, please follow these steps:

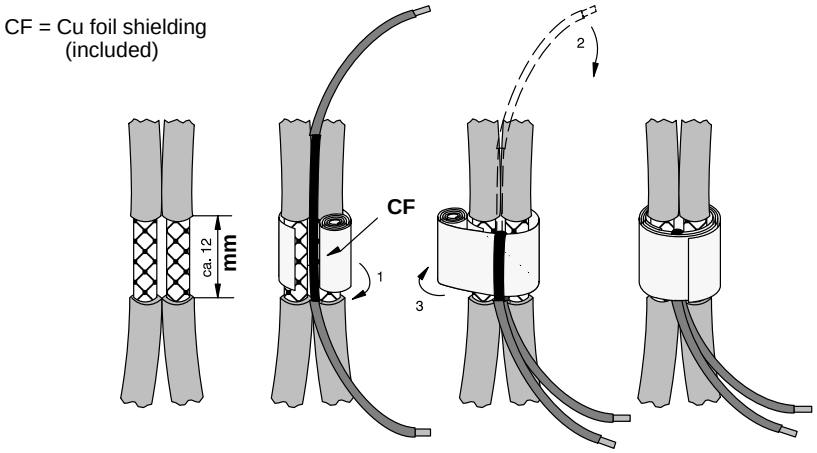


Figure 25 Installation of Shielding Connection with Potential–Free Grounding

☞ **Note:** On the bus end devices, this grounding method requires only one cable.

Breite: 185 mm
Höhe: 230 mm

3.2.7 PROFIBUS–DP Repeaters

Repeaters may be used where the maximum line length of a network segment is exceeded or where the number of devices used exceeds the maximum number of devices allowed per segment. In these cases the line length can be extended or the number of devices can be raised by using a repeater. When using repeaters on segment end devices make sure to install a bus termination.

Installation Example of Terminator Locations:

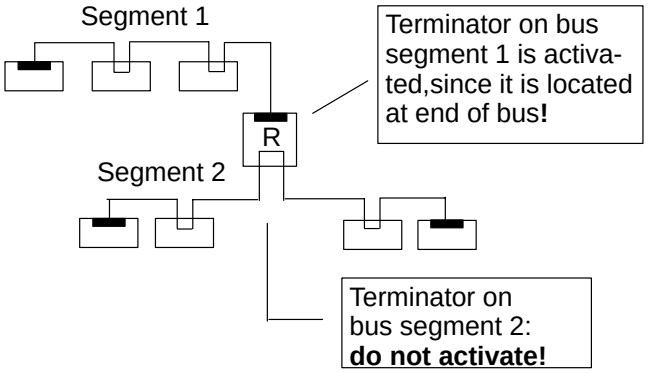

Segment 1
Terminator on bus segment 1 is activated,since it is located at end of bus!
R
Segment 2
Terminator on bus segment 2: do not activate!

Figure 26 Connecting Two Bus Segments to RS–485 Repeater

For cabinets, only RS485 Repeaters of safety type IP20 are allowed (e.g., Siemens, Order No. 6ES7 972–0AA00–0XA0)

Example of repeater:
Set the bus transfer rate using the <Bitrate> rotary switch. The repeater requires a power supply of 24 Volts DC, i.e., the jumper connection between M and PE of the repeater power supply must be removed. It is not necessary to set a bus address for the repeater. However, the repeater uses a device address, i.e., the maximum number of slaves in a segment is reduced by the number of repeaters used. For detailed information see the specifications provided by the manufacturer.

3.2.8 Backplane Grounding of the Quantum CPU

For protection against interference and accidental contact each backplane must be connected to the protective conductor (PE) over a minimum cable diameter of 6 sqmm using the ground screws of the backplane.

In all cases, the internal reference potential 0V of the backplane XPB 00 X is connected to the backplane (delivery state) over the Z screw (see figure below).

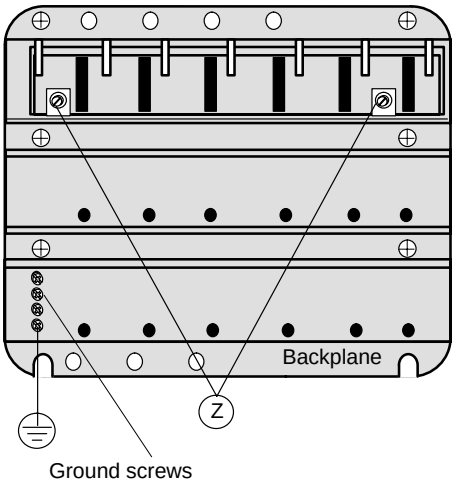


Figure 27 Quantum Z Screw,

Breite: 185 mm
Höhe: 230 mm

3.2.9 Grounding of Backplane DTA 200 of the Compact Periphery

For protection against interference and accidental contact each zinc coated top hat rail with inserted components must be connected to the protective conductor (PE) over a minimum cable diameter of 6 sqmm.

The DTA 200 backplanes may be installed with or without electronic connection to ground potential. Prior to initiation, please verify that the Z screw provided for this purpose is fastened to the backplane, i.e. that the internal reference potential 0V is connected to PE. For the Z screw location please see the figure below.

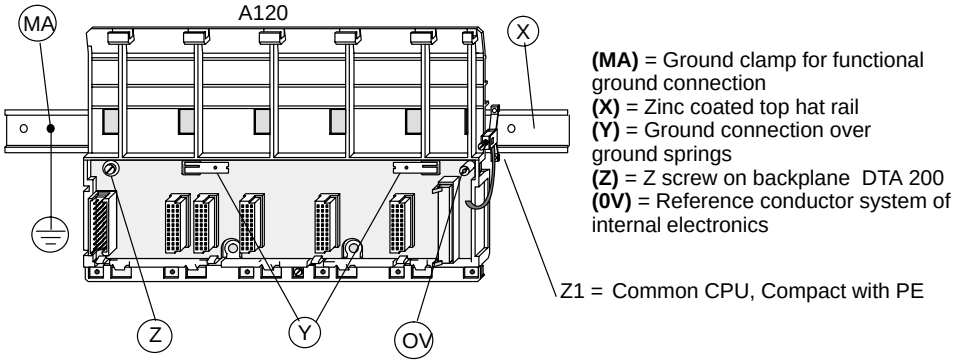

A120
MA
X
Z
Y
0V
(MA) = Ground clamp for functional ground connection
(X) = Zinc coated top hat rail
(Y) = Ground connection over ground springs
(Z) = Z screw on backplane DTA 200
(0V) = Reference conductor system of internal electronics
Z1 = Common CPU, Compact with PE

Figure 28 Compact, Grounding and EMC Measures, Z Screw

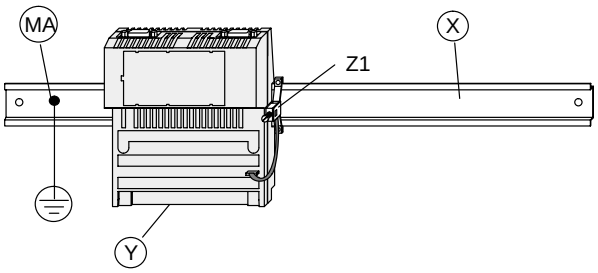
3.2.10 Grounding of TIO Components

For protection against interference and accidental contact each TIO component with inserted components must be connected to the protective conductor (PE) over a minimum cable diameter of 6 sqmm.

When mounting the TIO component on the top hat rail, the component PE is automatically connected to the top hat rail via a ground spring.

A connection between internal reference potential 0V and PE is normally established internally on the component using appropriate RF capacitors.

The Z1 connection is additionally required for ground protection. Grounding is ensured via a ground clamp (EDS 000) and a 2.5 sqmm CU Faston or screw connection.



(MA) = Ground clamp for functional ground connection
(X) = Zinc coated top hat rail
(Y) = Ground connection of the TIO component over ground spring
(Z1) = CU connection to top hat rail as a protective measure.

Figure 29 Grounding of top hat rails and TIO components

3.2.11 Additional Grounding Measures

☐ Connection to ground bus bar

To system, part 1:

☐ Quantum

- ▫ Quantum Backplane ()
- ▫ Zinc coated top hat rail from NAE 911 (*) (6 sqmm)
- ▫ Ground clamp EPS 001 (6 sqmm)
- ▫ Lay out bus cable shielding on bus ground bar using ground clamp

To system, part 2:

☐ A120

- ▫ Zinc coated top hat rail(s) from A120 (*) (6 sqmm)
- ▫ Lay out bus cable shielding on bus ground bar using ground clamp

To system, part 3:

☐ TIO

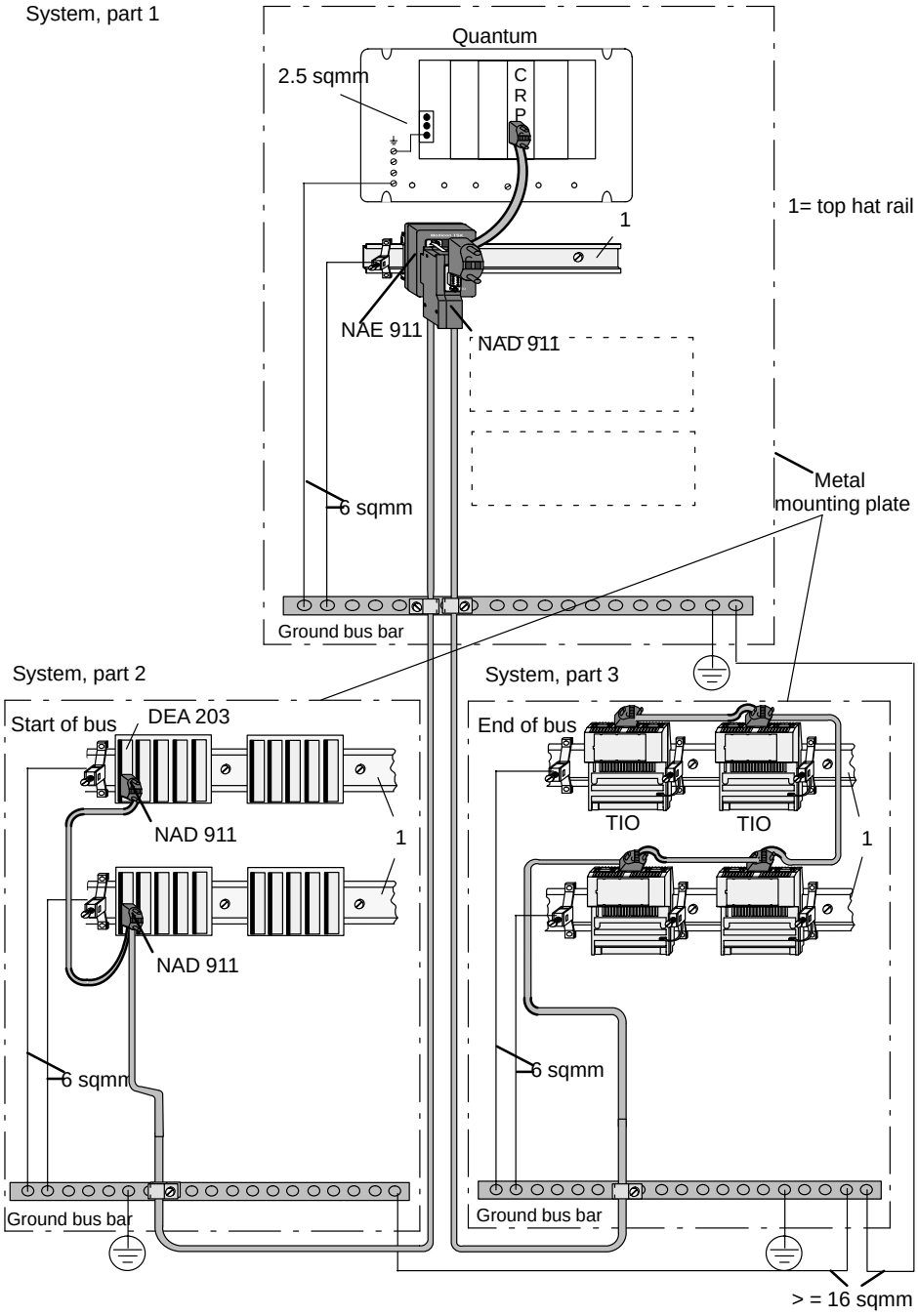
- ▫ Zinc coated top hat rail from TIO components (6 sqmm)
- ▫ Lay out bus cable shielding on bus ground bar using ground clamp

(*) Ground clamp EPS 001

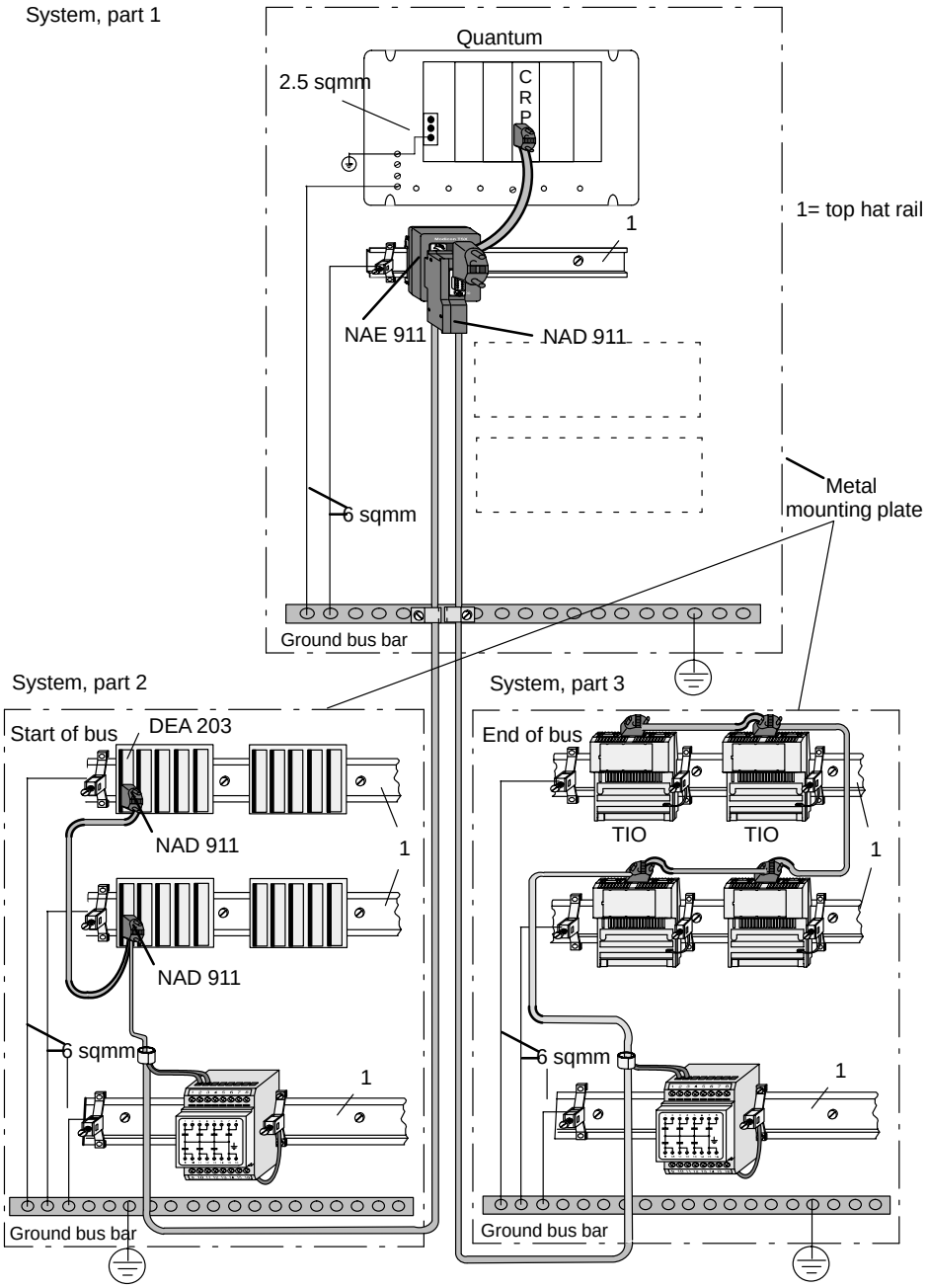
☐ >= 16 sqmm copper connection between ground bus bars.

Breite: 185 mm
Höhe: 230 mm

3.2.12 Example of an Indoor System ”with” Potential–Equalization Lines



3.2.13 Example of an Indoor System ”without” Potential–Equalization Lines



Breite: 185 mm
Höhe: 230 mm

3.3 Specifications

3.3.1 Cable specifications

Due to the maximum baud rate of 12 MBaud, only cables of the A type may be used, as defined by the PROFIBUS standard. According to EN 50 170, this cable type is a twisted pair line with a shield consisting of a foil shielding and an braided shielding in the layer above. Cable parameters are as follows:

Parameter	**Value**
Surge impedance	135... 165 Ohms at 3 to 20 MHz
Capacitance per unit length	< 30 pF / m
Loop impedance	< 110 Ohms / km
Lead diameter	> 0.64 mm
Lead cross section	> 0.34 sqmm

The following cable may be used as a PROFIBUS cable for fixed layout in grooves or pipes:

Manufacturer Schneider Automation Order No. KAB PROFIB	
For cable installation use the following color assignment (example)	Line A: red
	Line B: green

3.3.2 Connector Specifications

Both connectors with turn–off terminator (up to 1.5 MBaud) and ready–made connectors (up to 12 MBaud), such as ”integrated bus termination” , ”bus node”, and ”bus node with service SS” may be used.

The following Schneider Automation connectors have been defined for different field devices:

DP–Master	Bus connector with service interface (12MBd./ IP 20) Manufacturer Schneider Automation: Order No. 490 NAD 911 02 (up to 1.5 MBaud)* Order No. 490 NAD 911 05 (up to 12 MBaud)
Slave devices	Bus connector with / without service interface (12MBd./ IP 20) Manufacturer Schneider Automation: Order No. 490 NAD 911 02 (with service interface) up to 1.5 MBd * Order No. 490 NAD 911 03 (start or end termination) Order No. 490 NAD 911 04 (node) – up to 12 MBaud Order No. 490 NAD 911 05 (node with service interface)– up to 12 MBaud

* = run–out model up to 1.5 MBits/sec

☞ **Note:** The mounting procedure for bus connectors NAD 911 03 / 04 / 05 differs from the mounting procedure for NAD 911 02. Please refer to the installation instructions delivered with the respective component.

☞ **Note:** The specified NAD 911 02 cables and connectors must be installed according to the installation instructions delivered with the respective components. Also see chapter 3.3.2.2 on page 70

3.3.2.1 Pin Assignment NAD 911

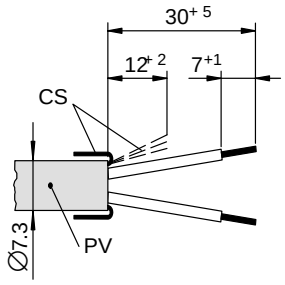
Pin / housing	Signal	Description
Connector housing	Shield	Functional ground
3	RxD/TxD–P	Receive / send data positive
5	DGND	Data transfer potential (reference potential to 5V)
6	VP	Supply voltage for terminators–P, (P5V)
8	RxD/TxD–N	Receive / send data negative

Breite: 185 mm
Höhe: 230 mm

3.3.2.2 Cable installation on NAD911 02

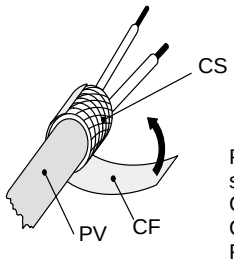
Step 1:
Cut the cable to the appropriate length

Step 2:
Prepare the cable ends (see figure)



Step 3:
Pull the braided shielding ”CS” over the PVC jacket ”PV”. Be sure to remove additional shielding foils with plastic lamination, if necessary.

Step 4:
Wrap the included Cu foil shielding ”CF” around the braided shielding (see figure).



Plotting
scale 1:1
CF Cu foil shielding
CS Braided shielding
PV PVC jacket

Step 5:
Fasten cable(s) ”D” to the connector using cable cleat ”C”.

Step 6:
Connect the two leads of the respective cable as follows: Lead(s) ”red” to terminal(s) 3 and 4–2 Lead(s) ”green” to terminal(s) 8 and 9–7

Step 7 (NAD 911 02)**:**
a) If two cables are connected to the PROFIBUS connector (**bus is looped through**), **all 3 jumpers (A) must be removed**.
b) If only one cable is connected (**start or end of bus**), **all 3 jumpers (A) must be connected**.

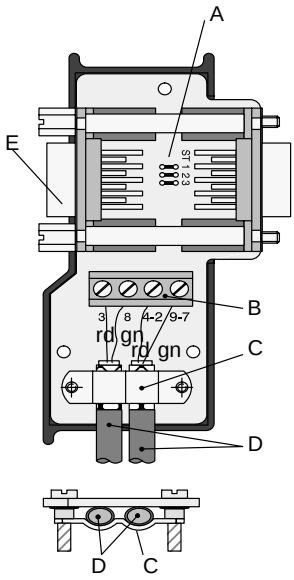


Figure 30 Handling and Connection of the 490 NAD 911 02 PROFIBUS Connector

3.4 Schneider Automation Products for PROFIBUS Installation with Quantum

Table 13 Hardware

Quantum	acc. to catalog
140 CRP 811 00	PROFIBUS–DP Master activation for use with Quantum
AS–BDEA 203	PROFIBUS–DP Slave activation for Compact I/O periphery connection. All digital and analog I/O modules may be used in combination with AS–BDEA 203.
BDI 344 01	PROFIBUS–TIO 16 dig. inputs, 24 V
BDI 354 01	PROFIBUS–TIO 32 dig. inputs, 24 V
BDM 344 01	PROFIBUS–TIO 16 dig. inputs, 24 V & 16 dig. outputs24 V / 0.5 A
BDO 354 00	PROFIBUS–TIO 32 dig. outputs 24 V / 0.5 A
Momentum TIOs	See Table 10, page 33

Table 14 Software Requirements

SW–MS1D–9Sa	Modsoft >=2.51 Programming Unit for Quantum (English)
332 SPU 833 01	Project and configuration tool for read–in of Device Data Base and parameterization of all PROFIBUS–DP devices
332 GSD 831 01	The software package contains Device Data Base files for all Schneider Automation I/O modules. They can also be downloaded from http://www.PROFIBUS.com

Table 15 PROFIBUS Accessories

KAB PROFIB	PROFIBUS cable, type ”A” (yard good), O2Y (ST) CY 2 x 0.64 sqmm
YDL 052	PC cable (9 pins) ↔ CRP / NOP (9 pins), length: 3 m
490 NAD 911 02	PROFIBUS connector with programming device connection (up to 1.5 MBaud)
490 NAD 911 03	PROFIBUS connector terminator (up to 12 MBaud)
490 NAD 911 04	PROFIBUS connector node (up to 12 MBaud)
490 NAD 911 05	PROFIBUS connector node with service interface (up to 12 MBaud)

Table 16 Installation Accessories

GND 001	Capacitive ground terminal clamp
HUT 3575	Zinc coated top hat rail (rail by DIN–EN 50022)
EDS 000	Ground cleat

Breite: 185 mm
Höhe: 230 mm

3.5 Example of PROFIBUS Test Certificate

Pos.	Test step	Test point	Nominal value	True value	Comments
All devices connected					
1.0	Check number of bus devices for each bus segment		<= 32		
2.0	Check maximum bus length according to selected transmission devices		Table 11 on page 52		
No devices connected					
2.1	Check bus length according to loop impedance. Connect leads A–B or terminals 3 at one end of the bus to pin 8 of the bus connector and measure the impedance between leads A–B at the other end.	3–8 *)	For line with diam. 0.34 sqmm approx. 0.12 x bus length (meters)		Lead impedance of cable type A must not exceed 110 Ohms/km.
2.2	Check physical course of bus (control measurement), connect jumper 3–8 of the respective bus connector and measure at the end of the bus with terminators removed	3–8 *)			
2.3	Check bus termination, remove jumper 3–8 of the bus connector. Connect bus terminations at one end of the bus, remove bus termination at the other end of the bus, and measure at the end of the bus with terminators removed. Reconnect terminators.	3–8 *)	220 Ohms + value from meas. 2.1		
3.1	Supply impedance at first device	3–6 **)	390 Ohms		Caution: Only activate terminator of the connector you want to measure.
3.2		3–8 *)	220 Ohms		
3.3		5–8 **)	390 Ohms		
3.4	Supply impedance at last device	3–6..**)	390 Ohms		
3.5		3–8 *)	220 Ohms		
3.6		5–8 **)	390 Ohms		

Pos.	Test step	Test point	Nominal value	True value	Comments
Only first and last bus device connected					
4.1	Measure voltage over terminators at the first bus device	3–8 *)	1.10 Volts		Measurement of direct current
4.2		3–6 **)	1.95 Volts		
4.3		5–8 **)	1.95 Volts		
4.4	Measure voltage over terminators at the last bus device	3–8 **)	1.10 Volts		
4.5		3–6 *)	1.95 Volts		
4.6		5–8 **)	1.95 Volts		
4.7	Measure voltage at the PROFIBUS connectors of the remaining bus devices	3–8 **)	1.10 Volts		It is not necessary for the connector to be plugged in.
4.8	Remove the connector at one end device and measure the bus voltage in idle state	3–8 **)	0.62 Volts		Measurement of direct current
All bus devices except master are connected					
4.9	Measurement of bus voltage in idle state	3–8 **)	0.62 Volts		Both terminators are active

*) = Terminal B of 490 NAD 911 02 acc. to Figure 30 on page 70

**) = Connector E of 490 NAD 911 02 acc. to Figure 30 on page 70

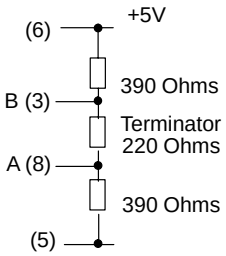


Figure 31 Bus Termination

Breite: 185 mm
Höhe: 230 mm

Chapter 4
Software Configuration

Breite: 185 mm
Höhe: 230 mm

4.1 Information for PROFIBUS DP

4.1.1 General

The goal of this chapter is to describe the configuration steps in global for PROFIBUS. But since this is not really possible without knowledge of the nearer network surroundings, this and the interaction between the various software packages will be handled.

☞ **Note:** The reader of this documentation should be well aware of the involved principles and functional relationships of PROFIBUS (e.g. DIN 19245, Parts 1,2 and 3).

The description is based in the simplest case upon a plant configuration consisting of a Quantum PLC and various SAD–I/O modules from the TIO and Momentum series. These components are linked over an appropriate bus cable and a CRP 811 interface module with the Quantum PLC. An exchange of pure I/O data takes places over this connection, whereby the Quantum (CRP 811) is always characterized in the course of the configuration as the master, and the connected TIOs as slaves.

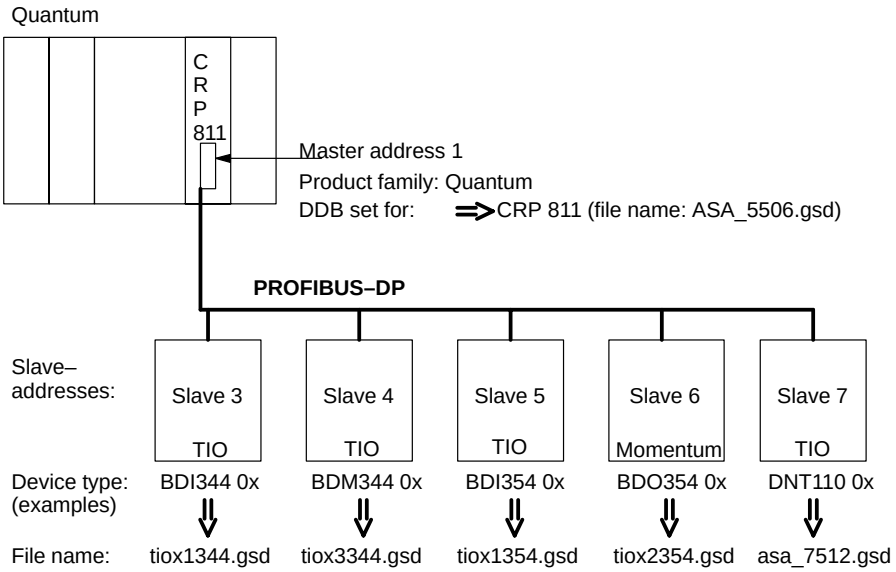


Figure 32 PROFIBUS–DP configuration

Breite: 185 mm
Höhe: 230 mm

Different manufacturers devices can be operated on this bus. A device data set is available for identification of the differing device types on the bus. For PROFIBUS–DP this is a device data base set. This data set is made available from the respective device manufacturer for each device type in the form of a GSD file.

A station specific Modsoft file is modified by the SPU931 tool, in being supplemented with addresses and diverse parameters, as well as state ram register ranges in which the slave I/O signals are reflected. These data sets are also transferred into the PLC when user programs are loaded.

4.1.2 Relationships between tools

It was already outlined and illustrated in this documentation, the following general sequence of tasks applies:

- ☐ Project specification (plant and stations) with the **Modsoft** software package.
- ☐ Inclusion of the device data sets (GSD files) with parameter modifications using the software packages **SPU 832** for PROFIBUS–DP.
- ☐ Address mapping and topology determination for bus controllers with the **SPU 931** software package for PROFIBUS DP.
- ☐ Loading the generated data into the PLC with Modsoft.

The following drawing demonstrates the relationships between the concerned configuration tools:

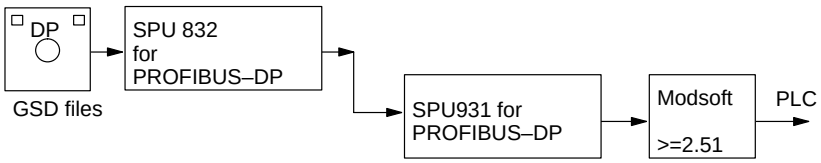


Figure 33 Configuration tool relationships (DP)

The device data sets (GSD files) are manufacturer specific and available on diskette or internet.

The required device data sets (GSD files) are imported by the SPU 832 tool and used for configuring of a bus project. The bus project has to be stored in a file.

The file produced is then imported with the SPU931 tool and further modified as needed. The result is then integrated into an existing Modsoft file and subsequently loaded into the PLC with the user program.

Breite: 185 mm
Höhe: 230 mm

4.2 Software Packages and their Features (DP Configuration)

Configuration of the DP communication takes place in 5 global steps and in the following sequence.

Create the plant name directing by a programm manager (WIN3.11) or explorer (WIN95/NT)

Step 1 Determination of the plant and station specific data on the PLC through the Modsoft software package, in particular:

- □ Plant name (**program name locations**)
- □ Station name (**program** .....)
- □ The communication parameters (e.g. Modbus or MB+ – required for PLC load)
- □ CPU type and surrounding hardware
- □ **State RAM ranges**
- □ Addition of the **CRP 811** interface module within Modsoft configuration (DP bus)
- □ **Config extension size**

Step 2 Determination of any bus specific data through the PROFI–KON–DP software configuration tool SPU832, such as:

- □ **Import** of device data base sets (**GSD** files)
- □ Selection of the DP Master and DP Slaves for the bus project.
- □ **Master/Slave** parameters
- □ Definition and saving of a bus project with all bus specific and slave specific data into the path PLANT\STATION. PLANT means plant name, STATION means station name (programm).

Step 3 Mapping (address assignments) of the DP Slave specific data with the SPU 931 configuration software to the state ram:

- □ **Import** of the bus project data (originating from the PROFI–KON–DP tool)
- □ Assignment of the bus project to the Quantum DP bus controller CRP811
- □ Assignment of the slave specific data (I/O points) to PLC state ram register addresses (state ram mapping).

Step 4 Initiate communication by:

- □ Load user program into the PLC
- □ Start communication

The following drawing should help illustrate the relationships of the processing steps.

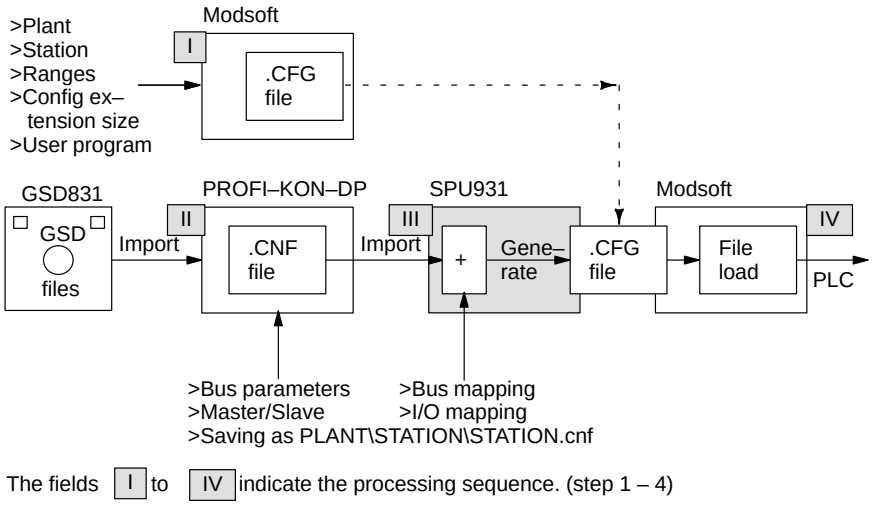


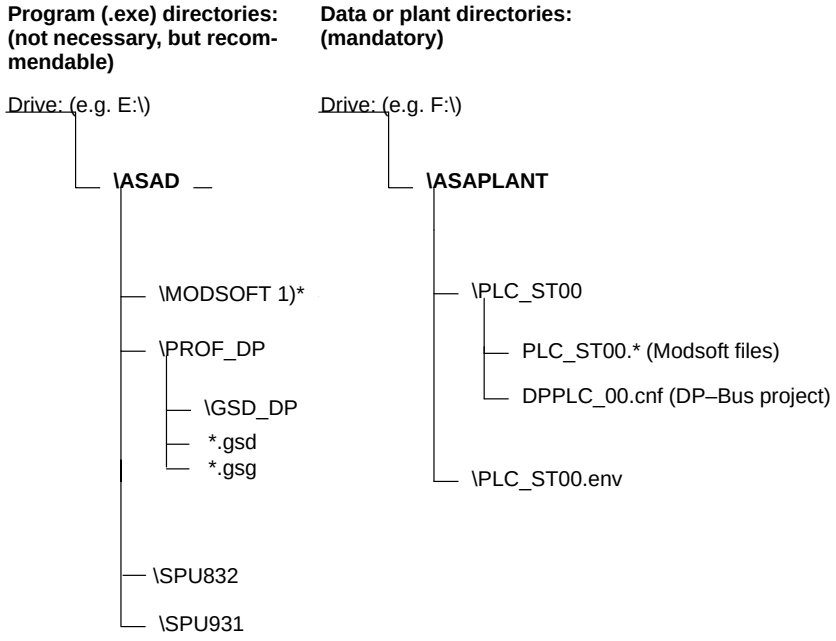
Figure 34 Quantum PROFIBUS–DP processing steps under Modsoft

☞ **Note:** The PROFI–KON–DP software package (SPU832) consists up to Version 1.60 of 1 independent diskette and a hard lock(dongle) diskette contains the executable configuration software, the for software protection. To make use of the software the dongle is must also be installed.
Until Version 1.6 (Windows 3.11 / 95) a token diskette is needed for software protection.

Breite: 185 mm
Höhe: 230 mm

4.3 Directory Structure for Programs and Data

A **common** directory structure is essential in guaranteeing correct interaction for all of the software packages participating in communications configuration.
A common directory structure is also essential for the different stations within a plant's network.



1)* The name is determined by the software

Figure 35 Program and data directory structures

4.4 Configuration Step by Step

The following description shows the global steps for configuration.

4.4.1 Modsoft Configuration Part (Step 1)

In the subsequent discussion configuration steps related to **DP** configuration will be handled.

☞ **Note:** The representation offered in Figure 36 only pertains to the DP configuration part.

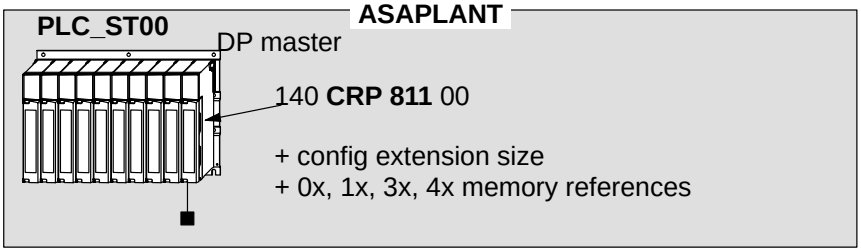


Figure 36 Quantum hardware for Modsoft PROFIBUS–DP configuration.

Names and their Meanings

ASAPLANT	Plant name (characterizes the program directory)
PLC_ST00	PLC station name (program name)
140 CRP 811 00	DP option board (bus controller)

Breite: 185 mm
Höhe: 230 mm

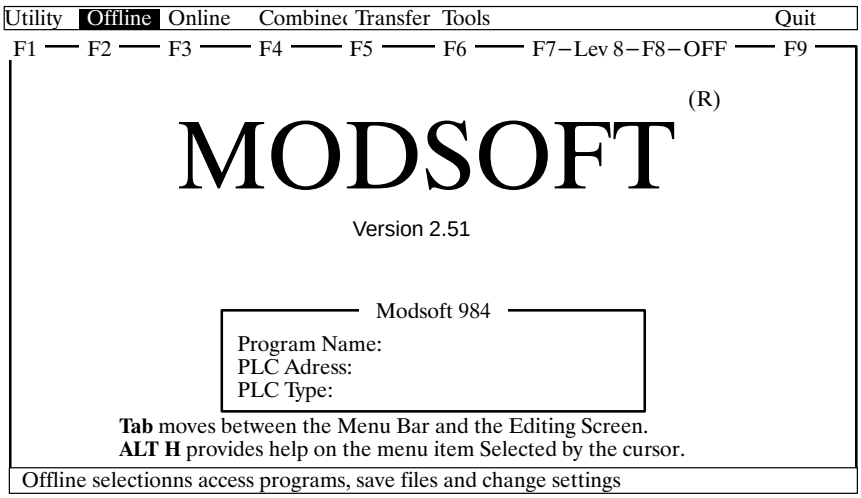

Utility Offline Online Combine Transfer Tools Quit
F1 F2 F3 F4 F5 F6 F7−Lev 8−F8−OFF F9
(R)
MODSOFT
Version 2.51
Modsoft 984
Program Name:
PLC Adress:
PLC Type:
Tab moves between the Menu Bar and the Editing Screen.
ALT H provides help on the menu item Selected by the cursor.
Offline selectionns access programs, save files and change settings

Figure 37 Start screen of Modsoft

☞ **Note:** Further sequences see User Instruction for POFIBUS-DP (840 USE 469 00).

4.4.2 Bus Topologie Configuration (Step 2)

In the next step you have to configure the bus topologie with the software tool SPU 832 01 (it is called also PROFI–KON–DP and a part of SPU 833 01).

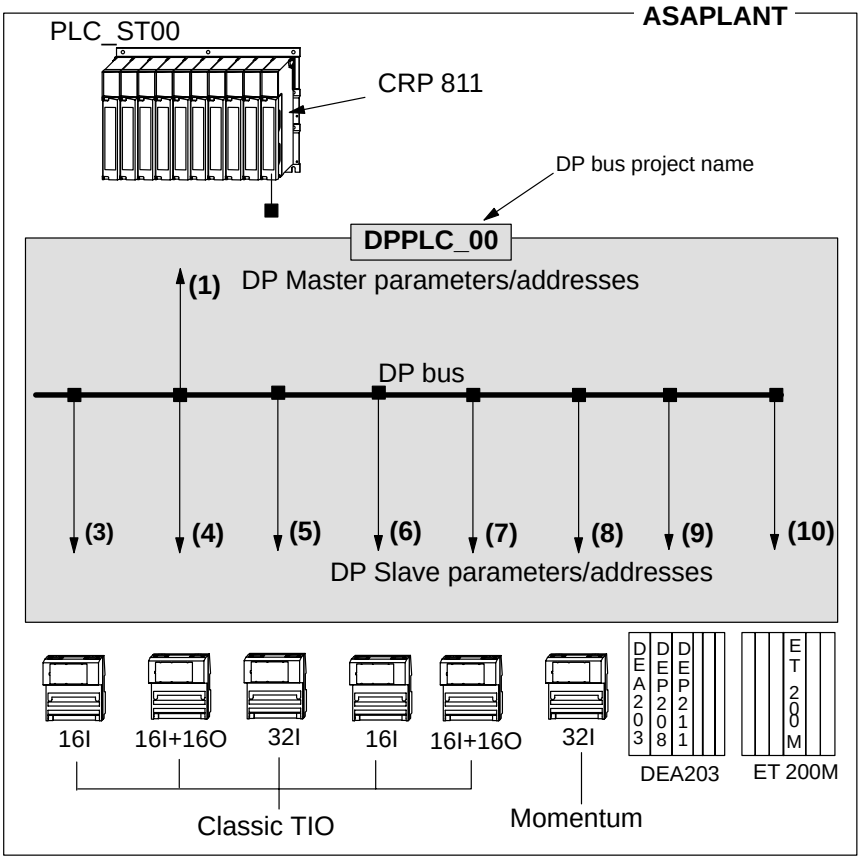


Figure 38 The bus topology to be configured

Breite: 185 mm
Höhe: 230 mm

After the installation under Windows and a corresponding program start, the following start screen appears.

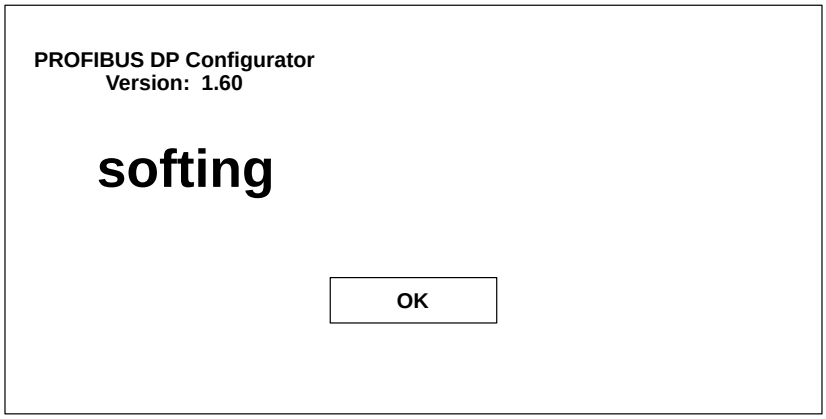


Figure 39 Start screen of the Software Tool to configure bus parameters

☞ **Note:** Further sequences see User Instruction for POFIBUS-DP (840 USE 469 00).

4.4.3 Mapping of I/O and Bus Project (Step 3)

In the following steps the slave I/O addresses will be mapped into PLC memory and the bus controller assigned to the bus project

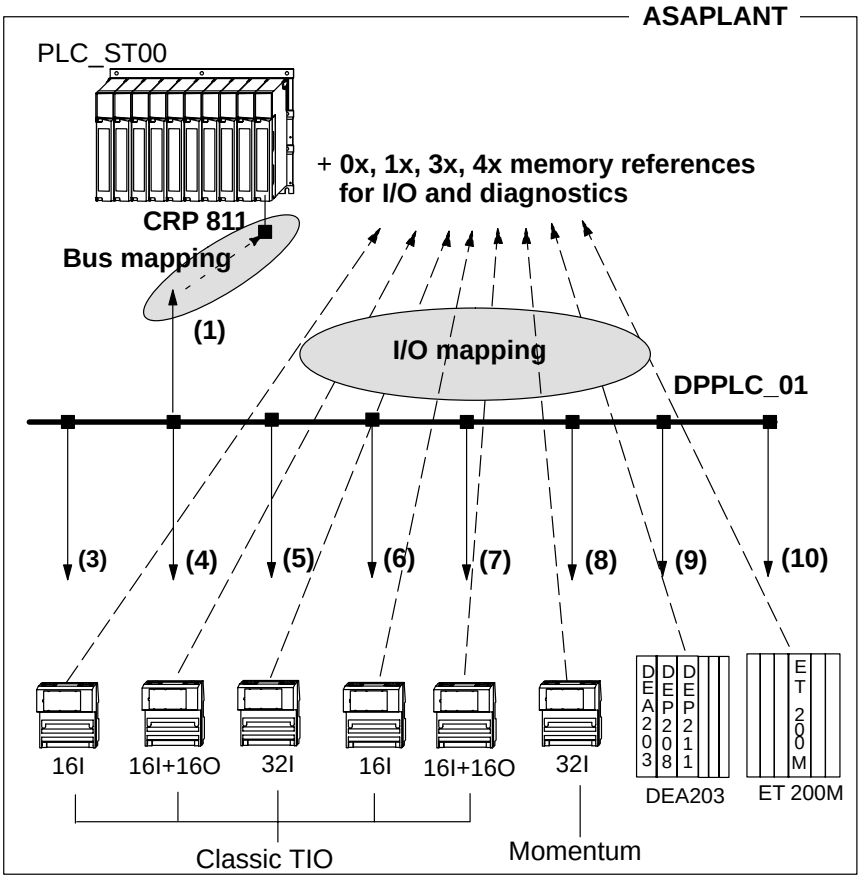


Figure 40 Assignment between the bus project and nodes of a plant

Breite: 185 mm
Höhe: 230 mm

After the installation under Windows and a corresponding program start, the following start screen appears.

Figure 41 Start figure of the Software Tool to map I/O and bus project

☞ **Note:** Further sequences see User Instruction for POFIBUS DP (840 USE 469 00).

4.4.4 Initiate Communication (Step 4)

Downloading CFG–file
If the CFG–file of the desired station is generated, your DP–configuration is ready for downloading into the PLC.

☞ **Note:** Loading under Modsoft (the station is already boot loaded) about menue ”Transfer”.

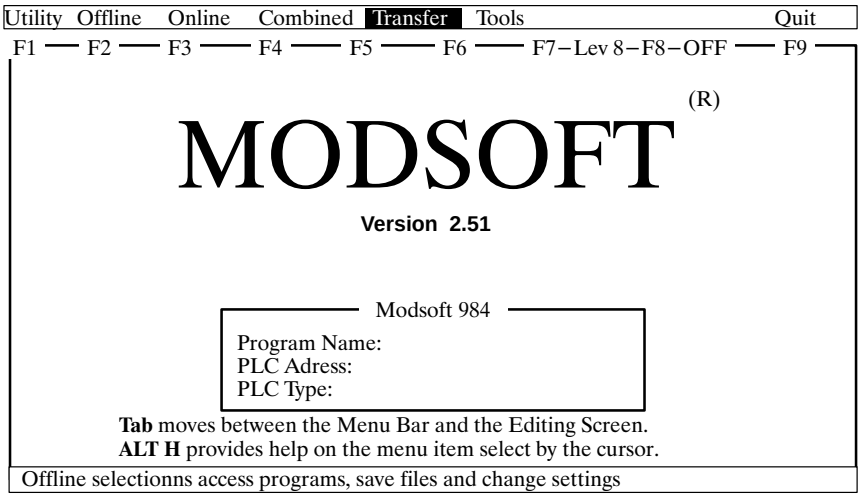

Utility Offline Online Combined Transfer Tools Quit
F1 F2 F3 F4 F5 F6 F7–Lev 8–F8–OFF F9
(R)
MODSOFT
Version 2.51
Modsoft 984
Program Name:
PLC Adress:
PLC Type:
Tab moves between the Menu Bar and the Editing Screen.
ALT H provides help on the menu item select by the cursor.
Offline selectionns access programs, save files and change settings

Figure 42 Finalizing of DP Configuration

Start Communication
After downlowding about menue ”Transfer” you can choice the start of communication about the menue ”Online” PLC Start / PLC Stop.

☞ **Note:** If you start the PLC you start the communication too.

End of DP Configuration

Breite: 185 mm
Höhe: 230 mm

Chapter 5
Diagnostic
for CRP 811

Breite: 185 mm
Höhe: 230 mm

5.1 Scope

This document describes the

□ RS 232C diagnostic interface and the

□ LED diagnostic

- □ of the PROFIBUS Network Option Board CRP 811 (PROFIBUS–DP) for Quantum product line.

The RS 232C diagnostic and LED diagnostic provides a method of an board online diagnostic from all relevant option board Software tasks / modules, configuration data and transfered data between PROFIBUS network and Quantum State RAM.

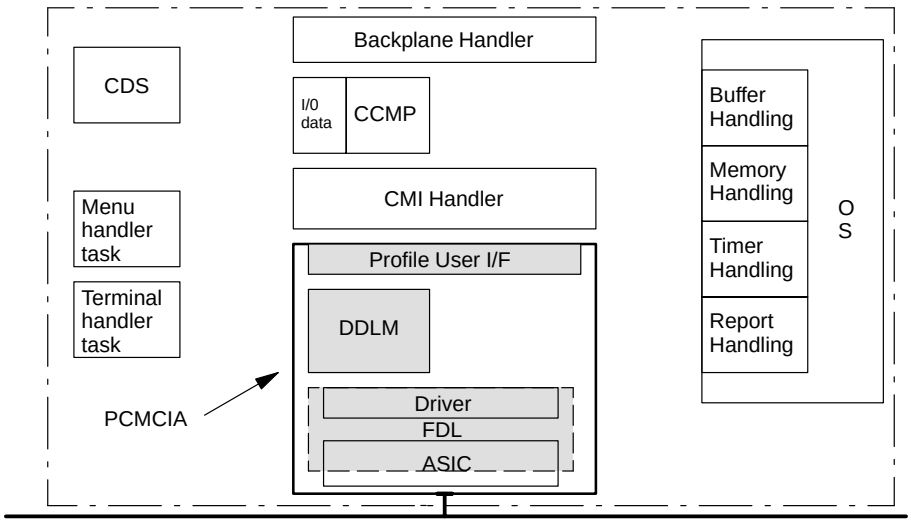


Figure 43 CRP 811 Software Tasks and Moduls

Legend
CDS: Configuration Data Download Server: local entity that controls the configuration process and distributes configuration data on a communication adapter.

CCMP: Coordination Channel Communication Manager: Profile specific module

CMI: Common Memory Interface

Breite: 185 mm
Höhe: 230 mm

OS: Operating System

DDLM: Direct–Data–Link–Mapper

FDL: Fieldbus Data Link

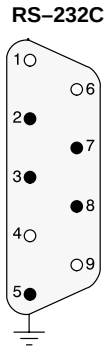
ASIC: Application Specific Integrated Circuit

PCMCIA: Personal Computer Memory Card International Association = PC–Card

5.2 RS 232C Diagnostic Interface

To use the RS 232 diagnostic interface connect a terminal or a PC with a terminal emulation program (e.g. ”PROCOMM”) on the RS 232C (SUB–D9) port socket.

For diagnosis connect the PC to the RS 232C (SUB–D9) port socket.
This requires one of the following cable configurations:
Serial Modbus cable 990 NAA 263–x0 or YDL 052.



Socket	Signal	Function
2	D2 (RXD)	Received Data
3	D1 (TXD)	Transmitted Data
5	E2 (GND)	Signal Ground
7	S2 (RTS)	Request to Send
8	M2 (CTS)	Clear to Send

● Pin occupied
○ N/C

Figure 44 RS 232C Port Diagram

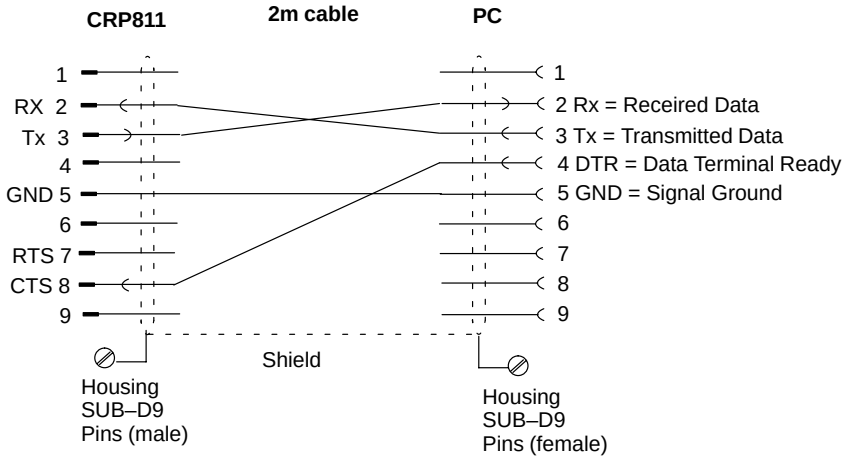


Figure 45 Example for a cable between PC and CRP811

Breite: 185 mm
Höhe: 230 mm

For print outputs on the terminal the CRP811 option board diagnostic interface needs a high signal on CTS over the cable connector from the PLC side.

Default Terminal Settings

- ☐ 19200 Baud
- ☐ 8 Databits
- ☐ 1 Stopbit
- ☐ no Paritybit

Remark
When using a PC as a terminal there is a possibility to use a Baudrate higher than the 19200 Baud used for terminal output, so that there will be a higher throughput to the PC and it's Logfile.

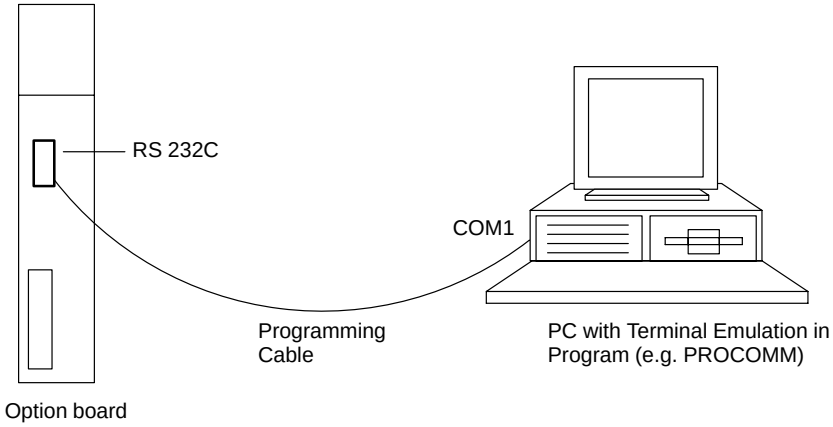


Figure 46 Connection the RS 232 Interface

5.2.1 Print out Modus

The RS232 diagnostic interface can be switched by the operator between the Menusystem and the normal print output modus from the option board. The normal print output modus is active after power up and after leaving the menu system with the keystroke of both, <CTRL> and <C>.

The normal output in the printout modus consists of the output of the activated error reports and of the output of the tasks according to their debug mask. This mask can be set/reset in the debug mask menu in the expert mode and the setttings will stay in effect till power down.

5.2.2 Menu System

The menu system will be activated in the printout modus by a keystroke (Carriage Return or SPACE) of the terminal and it will display the Main–Menu for selection of the required function. The menu will be exited to the printout modus with the keystroke of both, <CTRL> and <C>. The input of ”ESCAPE” will cancel a given input or menu.

5.2.2.1 Main Menus

The RS 232 diagnostic interface decides between the normal Main Menu and the Main Menu for Expert Modus.
The normal Main Menu (after power up) is shown in Figure 48, Page 115.
The Main Menu for Expert Modus is shown in Figure 49, Page 116.
All submenus in the Main Menu are activided with the given letters in the round brackets.

5.2.2.2 Error Report menu (e)

This submenu will allow the user to view the error report buffers of each task (see Figure 50, Page 116) , even if the Debugmask of the task has disabled the output of the reports. If the output is enabled by the debugmask, then the output will be sent automatically to the terminal handler task. But if there is no terminal connected to the UART, the data will be lost, because the data will be fetched from the task message queue and released immediately if there is no terminal connected. These lost data are still available in the error report circularbuffer in each task, so they can be viewed later on (see Figure 51, Page 117).

5.2.2.3 DP Data Menu (d)

This menu offers a selection to show global CCMP information, information about the data sent to the PLC and information about each slave connected to that CCMP. For further information see also chapter 5.5 (Page 107) and Figure 53 (Page 118) ... Figure 64 (123). The submenu ’s’ for the display of the slave data shows the output/input data as they are sent/received over the bus to/from the DP slaves. This format is not the same as the State RAM format!

5.2.2.4 Global Data Menu (g)

This submenu will allow the user to get information of the CRP811 firmware Version (headline of the screen), the PC Card (PCMCIA) firmware Version, the global Board status, the adress and size of the global heap , some print related object ID’s and the number of error reports that are saved for each task (see Figure 52, Page 117). There will be an additional Menu screen for the detailed output for the Board status for each task also chapter 5.2.2.10 on page 99).
The last line of the Global Data Menus see the user the configured Profibus data rate.

Breite: 185 mm
Höhe: 230 mm

5.2.2.5 Firmware Update Menu (u)

This submenu (see Figure 66, Page 124) will enable the user to reload the flash eprom on board with a new image. But be aware of the fact, that the board will remain in the flash loader state forever, if no image is loaded to the board with the Flash loader on the PC. The only possibility to cancel that load request once it has been issued is to switch the board's power off and on again! (see Figure 67, Page 125)

5.2.2.6 Terminal Setup Menu (t)

This submenu (see Figure 68 and Figure 69, Page 125) will allow the user to change the Baudrate of the UART in order to connect a PC as a 'Logging device' for the Output of the printf–task. This menu will allow to switch the Baudrate from 2400 Baud to 115000 Baud.

5.2.2.7 Expert Mode Menu (x)

This submenu (see Figure 70. Page 126) is used for entering the expert mode of the menu system, a mode that is used to enable the access to the following submenus. In order to switch to the expert mode the user has to enter a password (see Figure 71). This password is originally "ASAD E42", but it can be changed by the user to any other password with a length between 6 and 31 characters (see Figure 73 ... Figure 75, Page 129). The menu system will show the additional menu selections (see Figure 72, Page 127) only if the expert mode is true. The menus that are normaly accessible are the following ones :

(d) DP communication handler (for DP only)
(e) Error Report Menu
(g) Global Data Menu
(t) Terminal Setup Menu
(u) Firmware Update Menu
(x) Expert Mode Menu

The password is saved in RAM and if there is a new password entered by the user this new password is only valid until the next power up of the board.
In order to help the user there is a message showing wether the original power up password or the user password is to be entered.
The expert mode is only for debug use by an ASA technican or by a customer on demand by ASA to help in finding the problem of the malfunctioning board. The information of the normal main menu is all the customer needs to know of the board.

5.2.2.8 Board Reset Menu (r)

This submenu (see Figure 65, Page 124) will only be accesible in expert mode and it will enable the user to issue a board RESET by software instead of hardware. But be aware that this RESET is only valid for the option board and not for the PLC!

5.2.2.9 Memory Browser Menu (b)

This submenu (see Figure 76, Page 129) will only be accessible in expert mode and it will ask for the segment and offset values of the Startadress of the memory partition to be displayed. The display output will show the adress and 16 bytes in HEX and ASCII notation starting at that adress per line. After output of one page (256 byte) a new adress can be entered.

5.2.2.10 Task Information Menu (i)

This submenu will only be accessible in expert mode and it will allow the user to get information of a specific task on the board (see Figure 79, Page 131) . In this menu the user can select a task to get some information about this task. He will get an output as in Figure 80 (Page 131). Additionaly there may be further menu screens for each task, where more information is shown about its internal state and variables.

The menus for DP that are accessible here, are the same as the menus that are accessed via 'd' in the main menu.

There are only additional menus for the following tasks :

(b) backplane interface handler
(c) configuration data handler
(d) DP communication handler for DP only
(n) network interface handler

Menu for Backplane Interface Handler

This menu shows the global information of the backplane handler, e.g. Hook counters and other internal information. For further information see also chapter 5.6 (Page 113) and Figure 86 (Page 134) ... Figure 88 (Page 135).

Menu for network interface handler

This menu shows the global information of the PC Card handler, e.g. send/receive counters and other internal information. For further information see also chapter 5.7 (Page 114) and Figure 89 (Page 136) and Figure 90 (Page 136).

Menu for Configuration Data Handler

This menu shows the information of the configuration data handler and its internal information. For further information see also chapter 5.4 (Page 102) and Figure 81 (Page 132) ... Figure 85.

5.2.2.11 Debug Mask Menu (m)

This submenu will only be accessible in expert mode and it will display the debug masks of all tasks on the board and it will allow the user to change each tasks debug mask (see Figure 77 and Figure 78, Page 130). These changes are only valid until the next power up, when the default values will be restored to the factory settings again.

Breite: 185 mm
Höhe: 230 mm

5.3 LED Diagnostic

For online LED diagnosis, option board use 7 LED fields in the front panel.

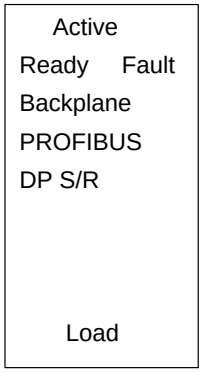


Figure 47 Status LEDs of the Option Board CRP 811

- The LEDs Active, Ready and Fault have the standard meaning like Quantum I/O and option moduls.
- Additionaly the Active LED is used to indicate the firmware download from a PC to the option board.
- The LEDs Backplane, DP S/R, PROFIBUS and Load are used in two ways. Either to indicate the transfer of PROFIBUS user data and config data or to indicate error/fault conditions from option board internal software tasks and software moduls.

To indicate the different functions on the LED block the following basic blink frequencies and its abbreviations are defined for the option boards:

- OFF: LED is off (dark)
- ON: LED is on
- SLOW flashing frequency: 400 ms on and 400 ms off
- MEDIUM flashing frequency: 200 ms on and 200 ms off
- FAST flashing frequency: 100 ms on and 100 ms off
- Fault code: Blink sequence from 1 to 12 on and off states followed by a pause. Blink sequence and pause are repeated with a period of 6,4 sec.
- ODD Blink: Repeated irregular blink sequence

Table 17 Status LEDs of the CRP 811

LEDs	Color	Function
Active	Green	On: CPU is in ”Run” mode and the backplane communication active Flashing: The flash rom load operation is active
Ready	Green	On: Module in operation
Fault	Red	Off: Error free operation On: Other LEDs are flashing with faults code
Backplane	Green	Off: Error free operation Flashing with fault code: on backplane fault
PROFIBUS	Green	Off: Error free operation Flashing with fault code: on erroneous configuration data or PROFIBUS fault
DP S/R	Green	Fast flashing frequency: Sending/Receiving DP bus data Medium flashing frequency: Configuration Slaves Slow flashing frequency: Waiting for configuration data Flashing with fault code: on erroneous configuration data
Load	Yellow	Flashing: Configuration data load operation active Flashing with fault code: on load operation fault

Caution: To reset the fault LED (red) the CRP811 must be powerd off / on by hot swap or PLC off / on.

Breite: 185 mm
Höhe: 230 mm

5.4 Diagnostics for the CDS task

For the LED ”Load” assigned to it, CDS uses the following blink codes to signal its state and error conditions:

Table 18 CDS LEDS Blink Codes

LEDs	Meaning
Permanently OFF	No task messages received / positive confirmation
Permanently ON	Startup. Not yet registered with the system interface
Slow Blink	CDS is initialized and waiting for messages
Medium Blink	Loading configuration data from the PLC
Fast Blink	Loading configuration data to the tasks (CMI Handler, CCMP, ICMP)
Odd Blink	Error Report made, if not shown by a Blink_Code_1 to Blink_Code_12
Flash	not used
Blink Code 01	fault in PC Card configuration data
Blink Code 02	fault in CCMP configuration data
Blink Code 03	fault in ICMP configuration data
Blink Code 04	fault in ICOM configuration data
Blink Code 05	fault in function ’CDS_handle_received_Send_Data_Msg’
Blink Code 06	fault at receiving and/or sending a task message
Blink Code 07	fault while loading configuration data from PLC to CDS
Blink Code 08	fault while loading configuration data from CDS to tasks (PC Card,CCMP,ICMP and/or ICOM)
Blink Code 09	a wrong Board type is configured
Blink Code 10	fault in function ’Handle_service_message’ for subsystem PC Card,CCMP,ICMP,ICOM
Blink Code 11	fault in function ’Handle_service_message’ for subsystem Backplane handler
Blink Code 12	fault in function ’Handle_service_message’ for subsystem CDS

The Output of the Error report has in the component ’Detail’ the CDS_State as the higher word and the sending Subsystem as the lower word. In the component ’Line’ is the Linenumber of the Errorreport call. In the component ’Code’ there is mostly the reason for the error (e.g. service_class,subssytem,...). If an error report is made and the reason could not be assigned to the blink codes 1 to 12 then the blink code will be ’ODD’.

Table 19 CDS Error Report

Message ID	Member Code	Meaning of the message ID
3	slot ID searched for	config data for this slot ID was not found
9	Timer type	a wrong timer type was received
102	service class / service	there are no more memory resources available
103	Error Code	there was an error while receiving a task message for CDS
104	Error Code	there was an error while sending a task message from CDS
105	message type	an invalid message type was received
106	service	a wrong service was received
107	service class	a wrong service class was received
108	received PLC state	a wrong PLC state was received
109	received Hook type	a wrong Hookout type was received
110	CDS state	a wrong CDS State is encountered
111	Cfg Load status	there was an error while loading configuration data
112	service class / service	this is an invalid PDU, that is rejected
113	service class / service	an invalid subsystem is received
114	Invoke ID	a wrong Invoke ID is in the received message
115	Error Code	an error occurred while loading configuration data from the PLC
116	PDU type	an invalid PDU type was received
117	Error Code	there was an error while sending an unconfirmed START service
118	service class / service	this subsystem / task does not exist
119	Board type	a wrong board type is configured

Breite: 185 mm
Höhe: 230 mm

Table 20 Error Code for CDS Error Report

Error Code	Meaning of the Error Code for 'status' in above table
– 4101	no memory available or no data attached to response
– 4103	no resource available / Timeout at Task message receive call
– 4107	Timeout at Task message receive call
– 4109	there was an invalid parameter in the PDU
– 4112	invalid timer message type
– 4118	an invalid message type was received
– 4119	an invalid sending subsystem was received
– 4300	other initialization error while initializing CDS task
– 4303	an invalid service was received and rejected
– 4307	not supported
– 4401	an invalid PDU type was received
– 4403	an invalid service was received
– 4404	an invalid service class was received
– 4406	a service was rejected
– 5110	there was no entry in the extended configuration area for an option board
– 5801	a wrong CDS State is encountered
– 5802	an error occured while loading configuration data to a task
– 5803	an invalid subsystem was received
– 5804	a new configuration request from Backplane Handler received
– 5805	a wrong board type has been configured
– 5806	a wrong Invoke ID to a previous request is received
– 5807	while reading data from the PLC with Hookout protocol an error occured

The menu for the CDS is only accessible in the 'expert' mode in the 'Task Information' menu. There are the following 5 submenus :

Table 21 5 Submenus

Ref.	Meaning
(g)	global data
(m)	last sent message
(l)	load information
(s)	Status Notify events
(v)	internal values/counters

In the ’global data’ submenu the following values are shown :

- ☐ internal task state of the CDS
- ☐ the protocols that are supported by that option board (DP, FMS)
- ☐ the slot ID where this QOMP is inserted into the backplane
- ☐ the maximum size of bytes that can be transfered in one request
- ☐ the type of the last hook from the PLC
- ☐ the status of the PLC from the last hook from the PLC
- ☐ the board status bits (see also menu screen 2 of ’global data menu’)

And if the PLC_MEM_INFO function returns a valid status then there is another menu where the internal data of the PLC is shown (e.g. PageF adress, number of 4X registers, ...). This information is only for the developer of the board software relevant.

In the submenu for the ’last sent message’, the last message that was sent from the CDS will be shown, including the address and amount of data to be read from the PLC, if the message has a data pointer unequal NULL.

In the submenu of the ’load information’ there is an information of amount of data that were loaded to the PC Card handler, the CCMP, the ICMP and the ICOM. There is also an information about the error context of the loaded data available. This error context consists of the following context code and an return error of the load function for the configuration data.

Breite: 185 mm
Höhe: 230 mm

The meaning of the context code per task is as follows :

Table 22 PC Card Handler

Bit	Meaning
no bit set	everything is OK
bit 0 set	error by profibus_init() or cmi_init() call
bit 1 set	error by call of DP_Master_INIT() function
bit 2 set	error with Busparameter
bit 3 set	error by activate busparameter call
bit 4 set	error by CRL Init_download call
bit 5 set	error by CRL Load_cfg_data call
bit 6 set	error by CRL Terminate_download call

Table 23 DP Data Handler

Number	Meaning
0	everything is OK
1	an error occured outside the configuration data
2	an error occured by the use of PLC_mem_info()
3	an error occured in the global DP configuration
4	an error occured in the slave part of the DP configuration

In the submenu for the ’internal values/counters’ the following values/counters are displayed :

- ☐ number of request PDUs to BP handler
- ☐ number of request PDUs to PC Card handler
- ☐ number of request PDUs to DP data handler
- ☐ number of positive response PDUs
- ☐ number of negative response PDUs

- ☐ number of error report counter
- ☐ number of reconfiguration counter
- ☐ number of Power UP hooks since last reset

5.5 Diagnostics for the CCMP Task

For the LED ”DP S/R” assigned to it, CCMP uses the following blink codes to signal its state and error conditions:

Table 24 CCMP LED Blink Codes

Blink Codes	Meaning
Permanently OFF	Resetting (state: Resetting). No task messages received (state: Running).
Permanently ON	Startup. Not yet registered with the system interface (state: Initializing).
Slow Blink	Waiting for configuration data (states: Initializing, Loading)
Medium Blink	Downloading slave parameter sets (state: Configuring Slaves).
Fast Blink	Ready to run (state: Stopped, Synchronizing).
Odd Blink	not used
Flash	Task message received (state: Running).
Blink Code 01	Unable to register with operating system error reporting service
Blink Code 02	Error during basic task initialization
Blink Code 03	Out of memory while creating internal buffers and data management tables
Blink Code 04	Global configuration data inconsistent
Blink Code 05	Slave configuration data inconsistent (slave number: see error report)
Blink Code 06	Slave parameter download service failed
Blink Code 07	Timeout while waiting for slave parameter download confirmation
Blink Code 08	Unable to set stack operating mode
Blink Code 09	Unable to synchronize with Backplane Handler
Blink Code 10	Unable to synchronize with PCMCIA Handler
Blink Code 11	Start command not allowed in current state
Blink Code 12	reserved for future use

The normal state blink feature can be turned on/off by setting/clearing the corresponding bit of the CCMP debug mask. The error code blink feature is not affected by the settings of the debug mask, neither is the message flash feature in the Running state.

The following table lists the message ID’s for the CCMP error reports. Each error report has a unique message ID. For each message ID there is an explanation of the error cause and additional information about the component ’detail’.

Breite: 185 mm
Höhe: 230 mm

Table 25 DP Communication Handler Error Report

Message ID	Explanation and detail codes. The 32−bit detail code may hold multiple segments of additional information whose size is given in brackets
	Standard Error Messages
0	No errors. (Not used)
1	Unknown error. (Not used)
	Fatal Initialization Error Messages
2	Illegal state in task state machine. detail = DP service (8), DP service primitive (8), handler task state (16)
3	Could not get CDS task ID. Entity not started? detail = 0 (32)
4	Could not get profile handler task ID. Entity not started? detail = 0 (32)
5	Could not get backplane handler task ID. Entity not started? detail = 0 (32)
6	Could not get profile handler event flag group handle. detail = 0 (32)
7	Could not get backplane handler event flag group handle. detail = 0 (32)
8	Could not get communication message buffer handle. Buffer not created?. detail = 0 (32)
9	Could not get communication message buffer info. Buffer not created? detail = 0 (32)
10	Out of memory. detail = handler task state (16), service_class (8), service (8)
11	Out of memory while creating state RAM output data image buffer. detail = max. backplane message size (16), image buffer number (16)
12	Out of memory while creating state RAM input data image buffer. detail = max. backplane message size (16), image buffer number (16)
13	Out of memory while creating state RAM diagnostic data image buffer. detail = max. backplane message size (16), image buffer number (16)
14	Out of memory while creating slave output data image buffer. detail = slave_number (32)
15	Out of memory while creating slave input data image buffer. detail = slave_number (32)
16	Out of memory while creating slave diagnostic data image buffer. detail = slave_number (32)
17	Out of memory while creating slave output template buffer. detail = slave_number (32)
18	Out of memory while creating slave input template buffer. detail = slave_number (32)
19	Out of memory while creating slave diagnostics template buffer. detail = slave_number (32)
20	Out of memory while creating slave parameter set buffer. detail = slave_number (32)

Table 25 DP Communication Handler Error Report

Message ID	Explanation and detail codes. The 32–bit detail code may hold multiple segments of additional information whose size is given in brackets
	Task Communication Error Messages
21	Could not get a task communication buffer. detail = message buffer pool ID (32)
22	Error while receiving task message. detail = message_type (32)
23	Error while sending task message. detail = destination task ID (16), service_class (8), service (8)
24	Error while setting flag in flag group. detail = destination task ID (16), flag group ID (16)
25	Invalid task message type. detail = message_type (32)
26	Invalid system task message. detail = command code (32)
27	Invalid service task message. detail = source subsystem/task ID (32)
28	Invalid service class. detail = source subsystem/task ID (16), service_class (16)
29	Invalid service code. detail = source subsystem/task ID (16), service_class (8), service (8)
30	Invalid PDU type. detail = source subsystem/task ID (16), PDU type (16)
31	Unknown task message source entity. detail = source subsystem/task ID (16), PDU type (16)
32	Destination entity of received task message not CCMP. detail = source subsystem/task ID (16), destination task ID (16)
33	Service message rejected. detail = destination task ID (16), service_class (8), service (8)
34	Service message not accepted after multiple send retries. detail = destination task_ID (16), service_class (8), service (8)
	DP Data and DP Configuration Error Messages
35	Invalid slave ID. detail = slave number (16), slave node ID (8), master node ID (8)
36	Invalid slave data DPM offset. detail = slave number (16), offset (16)
37	Invalid slave data template. detail = slave ID (16), template entry number (16)
38	CC data size too large for backplane transfer image. detail = slave ID (16), template entry number (16)
39	Invalid or no PLC memory/state RAM information. detail = health table segment (16), register segment (16)

Breite: 185 mm
Höhe: 230 mm

Table 25 DP Communication Handler Error Report

Message ID	Explanation and detail codes. The 32–bit detail code may hold multiple segments of additional information whose size is given in brackets
	Task State and Task Configuration Error Messages
40	Not reset to accept a CDS InitLoad request. detail = handler task state (16), service_class (8), service (8)
41	Need CDS InitLoad request at the beginning of (re–)configuration. detail = handler task state (16), service_class (8), service (8)
42	Configuration data inconsistent. detail = handler task state (16), service_class (8), service (8)
43	Multiple configuration messages received from CDS. detail = handler task state (16), service_class (8), service (8)
44	CDS TerminateLoad request received while not in Loading state. detail = handler task state (16), service_class (8), service (8)
45	CCMP not in Configured / Stopped state while receiving CDS Start request. detail = handler task state (16), service_class (8), service (8)
	Global Configuration Data Error Messages
46	Out of range in configuration data buffer. detail = 0 (32)
47	Invalid master network node ID. detail = master node ID (32)
48	Invalid number of slave devices. detail = number of slaves (32)
	DP Slave Configuration Data Error Messages
49	Invalid slave output data DPM offset. detail = slave number (16), DPM output data offset (16)
50	Invalid slave input data DPM offset. detail = slave number (16), DPM input data offset (16)
51	Configured slave output data size too large (template). detail = slave number (16), data size (16)
52	Configured slave input data size too large (template). detail = slave number (16), data size (16)
53	Configured slave diagnostic data size too large (template). detail = slave number (16), data size (16)
54	Configured slave output state RAM data size too large (template). detail = slave number (16), data size (16)
55	Configured slave input state RAM data size too large (template). detail = slave number (16), data size (16)
56	Configured slave diagnostic state RAM data size too large (template). detail = slave number (16), data size (16)
57	Configured slave output discretes offset too large. detail = slave number (16), number of discretes in 0xxxx area (16)
58	Configured slave input discretes offset too large. detail = slave number (16), number of discretes in 1xxxx area (16)
59	Configured slave diagnostic discretes offset too large. detail = slave number (16), number of discretes in 1xxxx area (16)
60	Configured slave output registers offset too large. detail = slave number (16), number of registers in 4xxxx area (16)
61	Configured slave input registers offset too large. detail = slave number (16), number of registers in 3xxxx area (16)

Table 25 DP Communication Handler Error Report

Message ID	Explanation and detail codes. The 32–bit detail code may hold multiple segments of additional information whose size is given in brackets
62	Configured slave diagnostics registers offset too large. detail = slave number (16), number of registers in 3xxxx area (16)
63	Configured slave parameter length too small. detail = slave number (16), size of configured slave parameter set
	Profile Download and Service Error Messages
64	Invalid PDU size in PDU from profile. detail = DP service (16), DP primitive (16)
65	Invalid service code in PDU from profile. detail = DP service (16), DP primitive (16)
66	Invalid service primitive in PDU from profile. detail = DP service (16), DP primitive (16)
67	Unexpected service PDU from profile. detail = DP service (16), DP primitive (16)
68	Service request to profile failed. detail = DP service (8), DP primitive/if download: slave number (8), response status code (16)
69	Timeout while waiting for service confirmation from profile. detail = handler task state (16), DP service (8), slave number/operating mode (8)
70	Not allowed to handle unexpected profile messages in current state. detail = DP service (8), DP primitive (8), handler task state (16)
71	Invalid profile operating mode specified. detail = DP profile operating mode (32)
72	Unable to set required profile stack operating mode. detail = profile response status (16), required operating mode (16)
	Task Synchronization Error Messages
73	Unable to send synchronization message to profile handler. detail = 0 (32)
74	Unable to send synchronization message to backplane handler. detail = 0 (32)
75	Communication message buffers too small for DP parameter download. detail = message buffer pool ID (32)
76	Invalid PLC status in notification from backplane handler. detail = PLC status code (32)
77	Timeout while waiting for output scans. CPU failure? detail = configured timeout value (32)

Breite: 185 mm
Höhe: 230 mm

5.6 Diagnostics for the Backplane Handler Task

This menu is only accessible in the 'expert' mode of the main menu. In the menu for the Backplane handler there is a menu that consists of two screens. The first screen shows global data as follows :

□ Module ID of the board (e.g. 0x400 for DP)

□ state of the backplane handler

Table 26 State of the Backplane Handler

Number	Meaning
0	backplane handler not active
1	backplane handler waiting for configuration data
2	backplane handler configures the DPM
3	backplane handler has an error while configuring the DPM
4	backplane handler is active

□ timeout counter (reserved : 0 as default)
□ timeout on wait counter (reserved : 0 as default)
□ hook delay time (reserved : 0 as default)

□ maximum time for DP hooks
□ actual time for DP hooks
□ maximum time for configuration hooks
□ actual time for configuration hooks

with the time values in microseconds.

In the second screen the counters for the different hook types are shown, divided into the hooks that are received when the PLC is in 'stopped' state and in 'running' state. Only the hooks that are used by the board have a seperate counter, all non used hooks are counted in one general counter.

There is also a menu point, that allows to clear this backplane handlers data.

Breite: 185 mm
Höhe: 230 mm

5.7 Diagnostics for the PC Card handler task

This menu is only accessible in the ’expert’ mode of the main menu. The PC Card handler has a menu showing its global data. If the PC Card version is available, then this version string from the PC Card will be shown. Otherwise only the following counters will be shown :

Table 27 Counters

Type of Counter	Meaning
timeout counter	how many times has the PC Card detected a timeout
diagnostics counter	how many diagnostics indications are received
DP data output counter	how many messages are sent to the PC Card for DP output
DP data input counter	how many messages are received from the PC Card for DP input
sent messages counter	how many messages are sent to the PC Card
received messages counter	how many messages are received from the PC Card

There is also a menu point, that allows to clear this PC Card handler data.

5.8 Textboxes for Terminal Menu Handler

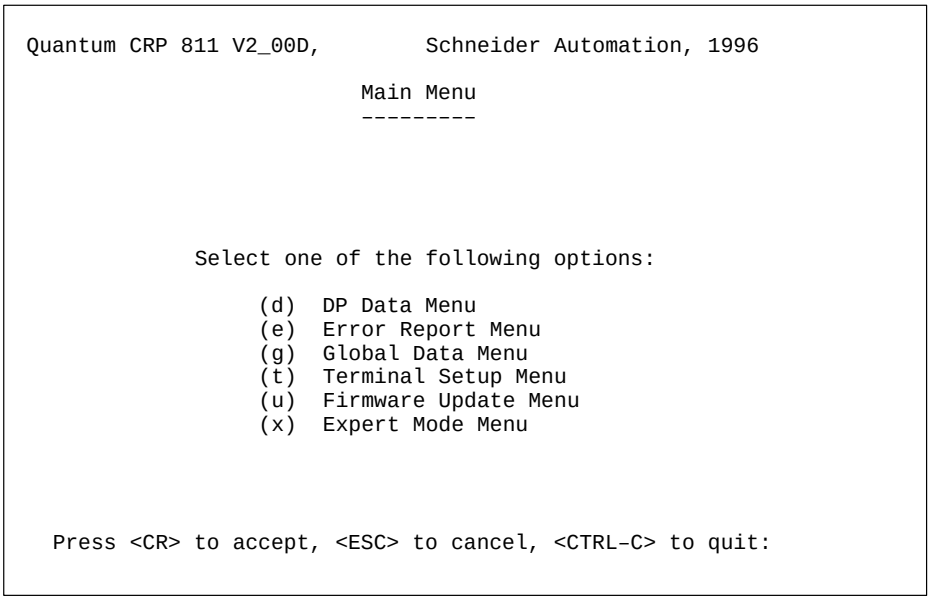

Quantum CRP 811 V2_00D, Schneider Automation, 1996
Main Menu
Select one of the following options:
(d) DP Data Menu
(e) Error Report Menu
(g) Global Data Menu
(t) Terminal Setup Menu
(u) Firmware Update Menu
(x) Expert Mode Menu
Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:

Figure 48 Output normal Main Menu after Power up

Note
The top line each textbox shows the current firmware version of CRP 811.
This Main Menu is starting at Version 2.00

Breite: 185 mm
Höhe: 230 mm

```
Quantum CRP 811 V2_00D,       Schneider Automation, 1996

                    Main Menu (Expert Mode)
                    -----------------------


               Select one of the following options:

                    (b)  Memory Browser Menu
                    (d)  DP Data Menu
                    (e)  Error Report Menu
                    (g)  Global Data Menu
                    (i)  Task Information Menu
                    (m)  Debug Mask Menu
                    (r)  Board Reset Menu
                    (t)  Terminal Setup Menu
                    (u)  Firmware Update Menu
                    (x)  Expert Mode Menu


  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 49 Output Main Menu for Expert Mode, selected with Submenu (x) in Figure 48

```
Quantum CRP 811 V2_00D,       Schneider Automation, 1996

                      Error Report Menu
                      -----------------

The number of buffered report entries per task is given in brackets.


                  Select one of the following tasks:

                (b)  backplane interface handler (00)
                (c)  configuration data handler  (00)
                (d)  DP communication handler    (00)
                (f)  FMS communication handler   (00)
                (m)  terminal menu handler       (00)
                (n)  network interface handler   (00)
                (o)  system object handler       (00)
                (s)  system timer handler        (00)
                (t)  terminal interface handler  (00)


  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 50 Menu for viewing Error Reports from Task Circular Buffer, selected with Submenu (e) in Figure 48 or Figure 49

```
Quantum CRP 811 V2_00D,       Schneider Automation, 1996

                     Error Report Menu
                     -----------------

The DP communication handler (Ver.00.100a) was created at Mar18 1996
            It was started at system startup + 00:00:00,00.
                Its error report buffer holds 1 reports.

        Error report number 1 from the DP communication handler:

                     time of creation : 00:00:16,27
                     module name      : CCMP.C
                     source line      : 348
                     error code       : –4107
                     error detail     : 0003E700h
                     error message ID : 69
                     caller           : 0792:07C5


  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 51 Output of an Error Report Entry, selected with Submenu (e) in Figure 48 or Figure 49

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                      Global Data Menu
                      ----------------

       build date                        : Mar 18 1996
       build time                        :    14:13:47
       PC Card firmware version          :        5.01
       PC Card firmware build date       :  25.01.1996
       global option board status        :       003Ch
       global heap base segment          :       0845h
       global heap size (bytes)          :      228272
       largest free block on global heap :      141936
       print task ID                     :       F607h
       print flag group handle           :       0502h
       print buffer pool handle          :       0601h
       task message buffer pool handle   :       0602h
       maximum task message buffers      :          30
       task message buffers used         :           1
       max. error reports per task       :          16
       Profibus data rate                     12MBit/s

  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 52 Output of the global Values for the Board, selected with Submenu (g) in Figure 48 or Figure 49

Breite: 185 mm
Höhe: 230 mm

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                        DP Data Menu
                        ------------

          This task controls all DP data mapping.


            Choose one of the following options:

              (h)  DP handler task information
              (d)  DP data image information
              (s)  DP slave information
              (m)  DP slave diagnostic (manual)
              (c)  DP slave diagnostic (cyclic)
              (o)  DP slave diagnostic (overview)
              (t)  DP slave diagnostic (statistic)


          Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 53 Submenu for DP Data Menu, selected with Submenu (d) in Figure 48 or Figure 49

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                        DP Data Menu
                        ------------
        global state                     :         12
        profile startup enabled          :          1
        profile stack operating mode     :        C0h
        output data transfer enabled     :          0
        output transfers since startup   :          0
        input transfers since startup    :       3895
        configuration error code         :          0
        configuration error context code :          0
        PROFIBUS master node ID          :          1
        PROFIBUS master PNO identifier   :      B204h
        number of slaves configured      :         25

        slave status bit table (1=active, 0=inactive)
1111111111111111 1111111110000000 0000000000000000 0000000000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000


  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 54 Output for global DP Data, selected with Submenu (h) in Figure 53

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                          DP Data Menu
                          ------------

           DP output data image dump (transfer #1)

   length= 55, type=1, fcode=5, crossover=0, segment=B000h

00081:000000000000001b 00097:000000000000000b 00113:000000000000000b
00129:000000000000000b 00145:000000000000000b 00161:000000000000000b
00177:000000000000000b 00193:000000000000000b 00209:000000000000000b
00225:000000000000000b 00241:000000000000000b 00257:000000000000000b
00273:000000000000000b 00289:000000000000000b 00305:000000000000000b
00321:000000000000000b 00337:000000000000000b 00353:000000000000000b
00369:000000000000000b 00385:000000000000000b 00401:000000000000000b
00417:000000000000001b 00433:000000000000001b



  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 55 Output for Data Output Image of DP, selected with Submenu (d) in Figure 53

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                         DP Data Menu
                         ------------

           DP input data image dump (transfer #1)

   length= 113, type=1, fcode=6, crossover=0, segment=B000h

10033:000000000111000b 10049:111111111111111b 10065:000000000000000b
10081:000000000000000b 10097:000000000000000b 10113:000000000000000b
10129:000000000000000b 10145:000000000000000b 10161:000000000000000b
10177:000000000000000b 10193:000000000000000b 10209:000000000000000b
10225:000000000000000b 10241:000000000000000b 10257:000000000000000b
10273:000000000000000b 10289:000000000000000b 10305:000000000000000b
10321:000000000000000b 10337:000000000000000b 10353:000000000000000b
10369:000000000000000b 10385:000000000000000b 10401:000000000000000b
10417:000000000000000b 10433:000000000000000b



  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 56 Output for Data Input Image of DP, selected with Submenu (d) Figure 53

Breite: 185 mm
Höhe: 230 mm

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                        DP Data Menu
                        ------------

         DP diagnostics data image dump (transfer #1)
  length= 1309, type=1, fcode=6, crossover=0, segment=B000h

30310:0000h (   +0.)   30311:000Ch (   +12.)   30312:0000h (    +0.)
30313:0001h (   +1.)   30314:0013h (   +19.)   30315:0054h (   +84.)
30316:0007h (   +7.)   30317:0000h (    +0.)   30318:0000h (    +0.)
30319:0000h (   +0.)   30320:0000h (    +0.)   30321:0000h (    +0.)
30322:0000h (   +0.)   30410:0000h (    +0.)   30411:000Ch (   +12.)
30412:0000h (   +0.)   30413:0001h (    +1.)   30414:0013h (   +19.)
30415:0044h (  +68.)   30416:0007h (    +7.)   30417:0000h (    +0.)
30418:0000h (   +0.)   30419:0000h (    +0.)   30420:0000h (    +0.)
30421:0000h (   +0.)   30422:0000h (    +0.)   30510:0000h (    +0.)
30511:000Ch (  +12.)   30512:0000h (    +0.)   30513:0001h (    +1.)
30514:0033h (  +51.)   30515:0044h (   +68.)   30516:0007h (    +7.)
30517:0000h (   +0.)   30518:0000h (    +0.)   30519:0000h (    +0.)

  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 57 Output of Diagnostics Data for DP, selected with Submenu (d) in Figure 53

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

        Information for DP Slave #2 (node ID 4, ACTIVE)
       ------------------------------------------------

      output discretes area               : 0xxxx–0xxxx
      input discretes area                : 10065–10080
      diagnostics discretes area          : 1xxxx–1xxxx
      output registers area               : 4xxxx–4xxxx
      input registers area                : 3xxxx–3xxxx
      diagnostics registers area          : 30410–30422
      DP parameter data size              :          14
      PNO identifier                      :       1344h
      diagnostics data byte #1            :   00000000b
      diagnostics data byte #2            :   00001100b
      diagnostics data byte #3            :   00000000b
      diagnostics data byte #4 (master)    :          1
      diagnostics data byte #5/6 (vendor) :       1344h
      station not reachable count         :          0
      station not ready count             :          0
      invalid response count              :          0
      input register for life sign        :     300013

  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 58 Information for a given Slave, selected with Submenu (s) in Figure 53

```
Quantum CRP 811 V2_00D,       Schneider Automation, 1996

                          DP Data Menu
                          ------------

          DP output data of DP slave #2 (node ID 4):




          No DP output data defined for this slave.




  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 59 Actual Input Data from a given Slave, selected with Submenu (s) in Figure 53

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                          DP Data Menu
                          ------------

          DP input data of DP slave #2 (node ID 4):

00h 00h









  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 60 Actual Output Data for a given Slave, selected with Submenu (s) in Figure 53

Breite: 185 mm
Höhe: 230 mm

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                         DP Data Menu
                         ------------

          Diacnostic for DP slave #1 (node ID 9):

Byte #1   Byte #2   Byte #3    Byte #4 (Master)   Byte #5/6 (vendor)
00000000b  00001100b  00000000b          1          1354h


           Diagnostic bytes #1 to #13 in Hexa Decimal

   00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19
0  -- 00 0C 00 01 13 54 07 00 00 00 00 00 00



  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 61 DP Slave diagnostic with manual update by keystroke, selected with Submenu (m) in Figure 11.

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                         DP Data Menu
                         ------------

          Diacnostic for DP slave #1 (node ID 9):

Byte #1   Byte #2   Byte #3    Byte #4 (Master)   Byte #5/6 (vendor)
00000000b  00001100b  00000000b          1          1354h


           Diagnostic bytes #1 to #13 in Hexa Decimal

   00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19
0  -- 00 0C 00 01 13 54 07 00 00 00 00 00 00



  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 62 DP Slave diagnostic with automatic update by runing diagnostic data, selected with Submenu (c) in Figure 11.

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                          DP Data Menu
                          ------------

                     DP diagnostic overview

R: Slave is running, ?: Slave is not running,
C: No Diagnostic available


addr\offs  00 01 02 03 04 05 06 07 08 09
      0                                R
     10    R     R  R


  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 63 DP Slave diagnostic overview with manual update by keystroke, selected with Submenu (o) in Figure 11

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                          DP Data Menu
                          ------------

                     DP diagnostic statistic


addr\offs  00  01  02  03  04  05  06  07  08  09
      0                                     003
     10  003      003 003


  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 64 DP Slave diagnostic statistic overview with manual update by keystroke, selected with Submenu (t) in Figure 11.

Breite: 185 mm
Höhe: 230 mm

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                       Board Reset Menu
                       ----------------

    The board will be completely reset to power up state.

All parameters that have been changed using the diagnostics terminal
(e.g. baud rate settings, debug masks) will be reset to default
state.



             Choose one of the following options:

         (a)  abort action and resume in normal mode
         (r)  reset and re-initialize board



  Press <CR> to accept, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 65 Software RESET of the Board, selected with Submenu (r) in Figure 49

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                    Firmware Update Menu
                    --------------------


    The board will be switched to firmware download mode. Having
finished the download successfully, the new firmware will be started.
The parameters of the serial interface will be reset to default.

In case of a download failure or user abort it may be necessary to
restart the board with a power down / power up to resume normal
operation.

               Choose one of the following options:

           (a)  abort action and resume in normal mode
           (e)  enter firmware download mode



  Press <CR> to accept, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 66 Activation of the Flash Loader, selected with Submenu (u) in Figure 48 or Figure 49

```
Quantum CRP 811 V2_00D,         Schneider Automation, 1996

                    Firmware Upgrade Menu
                    ---------------------


     Ready to perform firmware download. Keyboard input
will not be accepted until this operation has been finished.

  To cancel this operation turn power off and then on again.
```

Figure 67 Message Screen after Activation of the Flash Loader, selected with Submenu (u) in Figure 48 or Figure 49

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                     Terminal Setup Menu
                     -------------------

          Default Settings for Diagnostics Terminal

        serial interface  : r=19200, p=off, d=8, s=1
        cursor home       : ESC+H or CTRL+^ / CHR (30)
        cursor up         : ESC+A or CTRL+K / CHR (11)
        cursor down       : ESC+B or CTRL+J / CHR (10)
        cursor right      : ESC+C or CTRL+L / CHR (12)
        cursor left       : ESC+D or CTRL+H / CHR (8)
        toggle ins/overw  : TAB
        confirm selection : CR
        cancel action     : ESC
        enter menu mode   : CR or SPACE
        exit menu mode    : CTRL+C


  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 68 Output of the Terminal settings after Power Up, selected with Submenu (t) in Figure 48 or Figure 49

Breite: 185 mm
Höhe: 230 mm

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                    Terminal Setup Menu
                    -------------------

The parameters of the serial I/F will be set before return to the
main menu.

                   Choose one of the following options:

          (0)  19200 Baud, 8 data bits, 1 stop bit, no parity
          (1)  14400 Baud, 8 data bits, 1 stop bit, no parity
          (2)   9600 Baud, 8 data bits, 1 stop bit, no parity
          (3)   4800 Baud, 8 data bits, 1 stop bit, no parity
          (4)   2400 Baud, 8 data bits, 1 stop bit, no parity
          (5)   1200 Baud, 8 data bits, 1 stop bit, no parity
          (6)   9600 Baud, 7 data bits, 1 stop bit, even parity
          (7)   2400 Baud, 7 data bits, 1 stop bit, even parity
          (8)  38400 Baud, 8 data bits, 1 stop bit, no parity
          (9) 115200 Baud, 8 data bits, 1 stop bit, no parity

  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 69 Selection of a different Baudrate, selected with Submenu (t) in Figure 48 or Figure 49

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                     Expert Mode Menu
                     ----------------









             Select one of the following options:

                    (e)  enter password




  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 70 Menu for the Expert Mode available also in normal Mode, selected with Submenu (x) in Figure 48

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                        Password Menu
                        -------------


               The default password is active.









            Enter password:
```

Figure 71 Input of the Password to enter ”Expert Mode”, selected with Submenu (x) in Figure 48

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                       Expert Mode Menu
                       ----------------




             Select one of the following options:

                    (e)  enter password
                    (s)  set new password
                    (x)  exit expert mode




  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 72 Menu for Expert Mode in Expert Mode, selected with Submenu (x) in Figure 49

Breite: 185 mm
Höhe: 230 mm

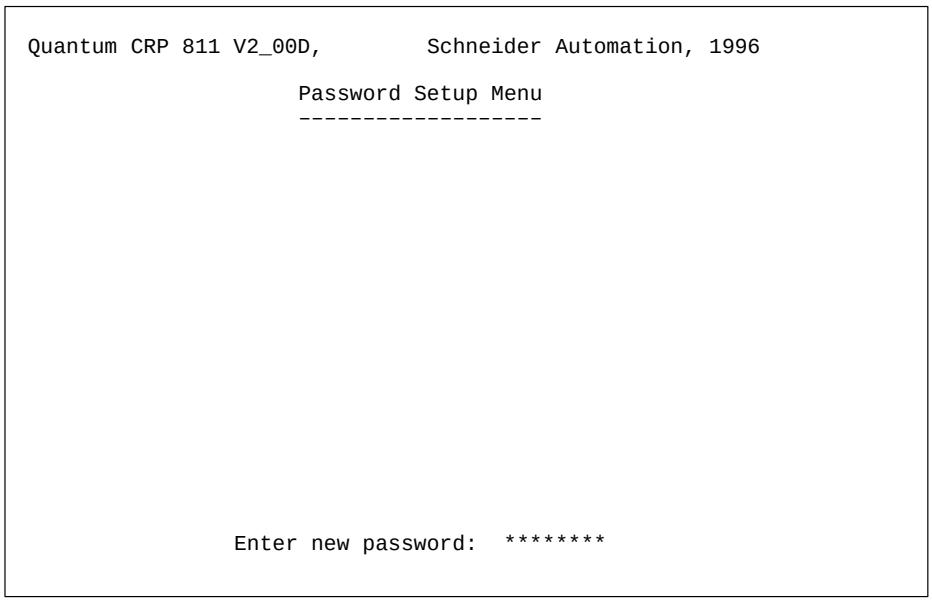


Figure 73 Input of a (new) Customer Password, selected with Submenu (s) in Figure 72

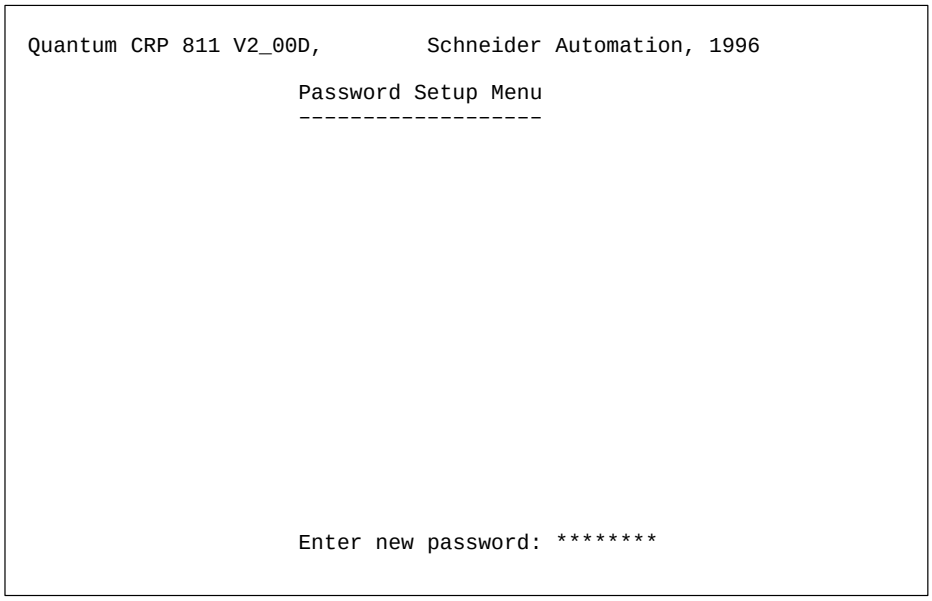


Figure 74 Reenter new Password once again, selected with Submenu (s) in Figure 72

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                    Password Setup Menu
                    -------------------


                 Your new password is valid.

      Do you want to save the new password permanently?
If you enter 'w', your new password will be written to memory
            and the option board will be reset.
DP communication will be disabled during the time needed to restart
the board.


             Select one of the following options:

             (n)  do not write password to memory
             (w)  write password to memory


  Press <CR> to accept, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 75 Do you want to save the new Password in RAM?, selected with Submenu (s) in Figure 72

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996
                    Memory Browser Menu
                    -------------------
addr\offs|00010203 04 05 06 07 08 29 0A 0B 0C0D0E0F|0123456789ABCDEF
---------+-----------------------------------------+----------------
FD00:0000|FAFCEB5C 90 00 00 00 00 00 00 00 00000000|...\............
FD00:0010|4153415F 44 45 55 54 53 43 48 4C 414E445F|ASA_DEUTSCHLAND_
FD00:0020|4C4F4144 45 52 5F 4E 4F 50 39 31 315F5F5F|LOADER_NOP911___
FD00:0030|50524F54 4F 54 59 50 45 5F 5F 5F 5F5F5F5F|PROTOTYPE_______
FD00:0040|5645522E 5F 54 30 30 30 30 30 30 2E30325F|VER._T000000.02_
FD00:0050|32302E31 31 2E 31 39 39 35 5F 5F 5F5F5F5F|20.11.1995______
FD00:0060|B810008E D8 8E D0 F8 B8 14 00 2D 1000BB10|.........-....
FD00:0070|00F7E305 BE 02 8B E0 B8 4C 00 BB 40004B2B|.........L..@.K+
FD00:0080|C3B103D3 E0 8B C8 E3 13 B8 48 FE 408ED8BE|..........H.@...
FD00:0090|0000B840 00 8E C0 BF 00 00 F3 A5 B88100BB|...@............
FD00:00A0|4D00432B C3 B1 03 D3 E0 8B C8 E3 0A8EC3BF|M.C+............
FD00:00B0|0000B800 00 F3 AB B8 1A 0C BB 5A 0B2BC3B1|...........Z.+..
FD00:00C0|01D3E88B C8 E3 11 8C C8 8E D8 BE 5A0BB800|............Z...
FD00:00D0|008EC0BF 00 00 F3 A5 B8 10 00 8E D8B81000|................
FD00:00E0|8ED88ED0 F8 B8 14 00 2D 10 00 BB 1000F7E3|........-.......
FD00:00F0|05BE028B E0 E9 38 00 F4 00 E8 C3 09B0FFA2|......8.........

        Enter address to continue dump from: FD00:010
```

Figure 76 Memory Browser Menu, selected with Submenu (b) in Figure 49

Breite: 185 mm
Höhe: 230 mm

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                      Debug Mask Menu
                      ---------------


     The current debug mask value is given in brackets.

             Select one of the following tasks:

        (b)  backplane interface handler (00000A01h)
        (c)  configuration data handler  (00001201h)
        (d)  DP communication handler    (00001A01h)
        (f)  FMS communication handler   (00000A01h)
        (m)  terminal menu handler       (00000A01h)
        (n)  network interface handler   (00000A01h)
        (o)  system object handler       (00000201h)
        (s)  system timer handler        (00000201h)
        (t)  terminal interface handler  (00000A01h)


  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 77 Menu for Viewing and Changing the Debug Masks of all Tasks, selected with Submenu (m) in Figure 49

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                      Debug Mask Menu
                      ---------------

Debug mask for the configuration data handler (select bit to change)

         XXXXXXXXh (xxxxxxxxxxxxxxxxAaflibphSsRrTtEe)
         00001201h (00000000000000000001001000000001)

     (a/A) additional debug support output
     (b)   beep when displaying critical messages
     (e/E) display error reports in short/long format
     (f)   enable LED flash mode during message/data transfers
     (h)   display buffer headers when sending/receiving
     (i)   display initialization status messages
     (l)   enable LED task state blink codes
     (p)   display task printouts (needed for the following)
     (r/R) display received task messages in short/long format
     (s/S) display task messages in short/long format before send
     (t/T) display timer messages in short/long format

  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 78 Menu for Setting/ Resetting each Bit in the Debugmask of a given Task, selected with Submenu (m) in Figure 49

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                  Task Information Menu
                   ---------------------


              Select one of the following_tasks:

               (b)  backplane interface handler
               (c)  configuration data handler
               (d)  DP communication handler
               (m)  terminal menu handler
               (n)  network interface handler
               (o)  system object handler
               (s)  system timer handler
               (t)  terminal interface handler


  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 79 Menu for Selecting the internal Task for which Display of internal Data is requested, selected with Submenu (i) in Figure 49

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                   Task Information Menu
                   ---------------------

 System task information of the backplane interface handler:
           version                : 0.001a
           date of creation       : Mar 18 1996
           task ID                : FC02h
           status                 : 0
           priority               : 50
           debug mask             : 00000A01h
           stack base             : 3476h
           stack size             : 2048
           stack used             : 382
           local heap base        : 0000h
           local heap size        : 0
           local heap free        : 0
           message queue size     : 32
           message queue used     : 0
           CPU usage hh:mm:ss,ddd : 00:00:43,117

  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 80 Submenu for the Backplane Interface Handler, selected with Submenu (b) in Figure 79

Breite: 185 mm
Höhe: 230 mm

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

            Configuration Data Handler Global Data
            --------------------------------------


                  internal task state:   0

              protocol(s) supported   :      DP
              backplane slot ID       :      10
              max. DPM transfer size  :    2510
              last hook type          :     01h
              global PLC state        :     20h
              board status bit mask   :    0000


                 PLC memory info is valid


  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 81 Output for global Information of the CDS, selected with Submenu (c) in Figure 79

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

         Configuration Data Handler Last Sent Message
         --------------------------------------------

                sending subsystem   :    247
                destination task ID :  FB05h
                message type        :      5
                send count          :      1
                service class       :      2
                service             :      5
                PDU type            :      3
                service specific    :    251
                status              :      0
                invoke ID           :     19
                data length         :      0




  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 82 Output of the last sent Message from the CDS, selected with Submenu (c) in Figure 79

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

         Configuration Data Handler Load Information
         -------------------------------------------


            PC Card data length      :         138
            PC Card error detail     :     0/0000h


            DP handler data length   :        1894
            DP handler error detail  :     0/0000h









  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 83 Output of the State of the Configuration Data Load, selected with Submenu (c) in Figure 79

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

       Configuration Data Handler Status Notify Events
       -----------------------------------------------

     hook type               :  Reconfiguration    (FF)
     controller state        :  reconfiguring      (FF)
     time of request in msec  :                    0 ms

     hook type               :  Power Up           ( 1)
     controller state        :  stopped            (20)
     time of request in msec  :                    0 ms









  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 84 Output of Ringbuffer for Status Notify Requests, selected with Submenu (c) in Figure 79

Breite: 185 mm
Höhe: 230 mm

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

     Configuration Data Handler Internal Counters/Values
     ---------------------------------------------------

      request PDUs to backplane handler      :         9
      request PDUs to PC Card handler        :         5
      request PDUs to DP data handler        :         5
      request PDUs to FMS data handler       :         0

      positive response PDUs                 :        14
      negative response PDUs                 :         0

      error report counter                   :         0
      reconfiguration counter                :         1
      Power UP hooks since last reset        :         1




  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 85 Output of the internal Coutners and Variables of the CDS, selected with Submenu (c) in Figure 79

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                   Backplane Handler Menu
                   ----------------------

       This task performs all backplane data transfer.



             Choose one of the following options:

                     (g)  global data
                     (r)  reset counters




  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 86 Menu for Backplane Handler global Data, selected with Submenu (b) in Figure 79

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

               Backplane Handler Internal Data
               -------------------------------

           module ID                  :       0400h
           handler state              :          4
           timeout counter            :          0
           timeout on wait            :          0

           hook delay                 :          0

           max. time for DP/FMS hook  :       4380
           last time for DP/FMS hook  :       2860

           max. time for config hook  :      36000
           last time for config hook  :      36000



  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 87 Backplane Handler global Data, selected with Submenu (g) in Figure 86

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

               Backplane Handler Internal Data
               -------------------------------

                 PLC in STOPPED state
       Powerup hook counter              :          1
       Exit Dim Awareness hook counter   :          1
       End of Scan hook counter          :      10930
       Dummy End of Scan hook counter    :          0
       Port 3 Preprocessing hook counter :          0
       User Logic hook counter           :          0
       other hooks counter               :      10932
                  PLC in RUNNING state
       Powerup hook counter              :          0
       Exit Dim Awareness hook counter   :          0
       End of Scan hook counter          :          0
       Dummy End of Scan hook counter    :          0
       Port 3 Preprocessing hook counter :          0
       User Logic hook counter           :          0
       other hooks counter               :          0
  Press <CR> to continue, <ESC> to cancel, <CTRL-C> to quit:
```

Figure 88 Number of Hooks from PLC, selected with Submenu (g) in Figure 86

Breite: 185 mm
Höhe: 230 mm

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                    PC Card Handler Menu
                    --------------------

        This task performs all PC Card data transfer.



             Choose one of the following options:

                    (g)  global data
                    (r)  reset counters




  Press <CR> to accept, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 89 Menu for PC Card Handler global Data, selected with Submenu (n) in Figure 79

```
Quantum CRP 811 V2_00D,        Schneider Automation, 1996

                    PC Card Handler Menu
                    --------------------


PC Card ident string: @(#1) PROFIcard PBFW_DP.SBN V5.01  25.01.1996


          timeout counter            :            0

          diagnostics counter        :           33

          DP data output counter     :       371616
          DP data input counter      :       403960

          sent messages counter      :           66
          received messages counter  :           69



  Press <CR> to continue, <ESC> to cancel, <CTRL–C> to quit:
```

Figure 90 Couter Values for PC Card Handler, selected with Submenu (n) in Figure 79

Appendix A
Module Discriptions

The following modules you will find:

140 CRP 811 00
AS–BDA–203

Breite: 185 mm
Höhe: 230 mm

140 CRP 811 00
Communication Module
PROFIBUS–DP
Module Description

140 CRP 811 00 link TSX Quantum devices to the PROFIBUS–DP as per DIN 19 245 Parts 1 and 3.

Enclosed you will find the following module specific information:

- ☐ Features and Function
- ☐ Configuration
- ☐ Diagnosis
- ☐ Technical Specifications

Breite: 185 mm
Höhe: 230 mm

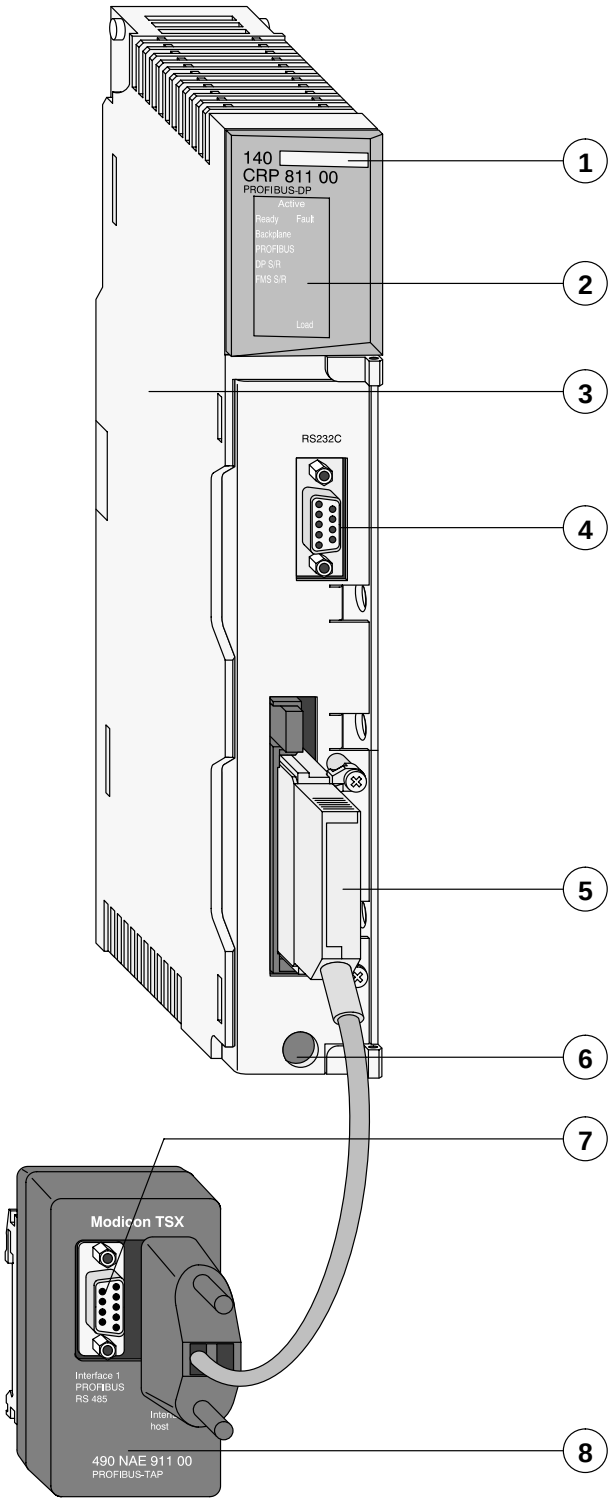


Figure 1 Front View

Positions of the User Accessable Parts

1 Color Code
2 LED Status Display
3 Quantum Module 140 CRP 811 00
4 RS–232C Port
5 PCMCIA Card (467 NHP 911)
6 Module Mounting Screws
7 PROFIBUS RS–485 Port
8 Transmission Access Point (490 NAE 911)

1 Features and Function

1.1 Features

The communication module serve ar the connecting linkage between the CPU and external PROFIBUS nodes.

1.2 Functional Details

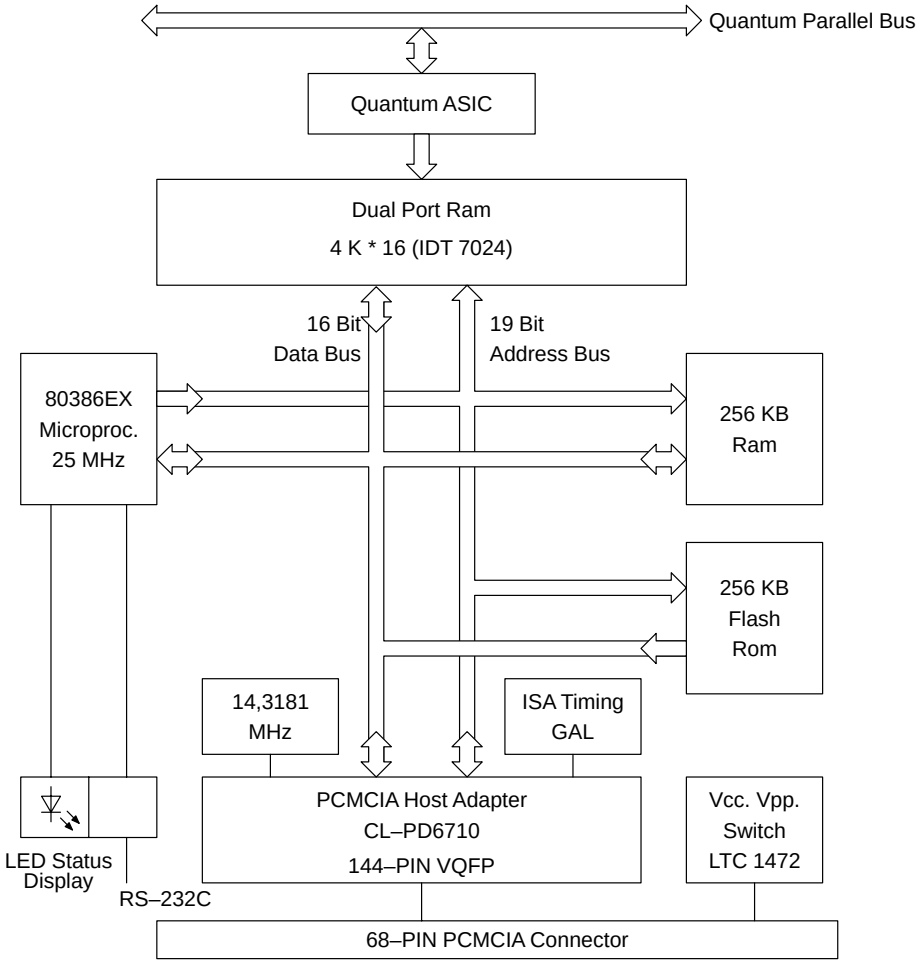


Figure 2 Functional Block Diagram of the Quantum Module

Breite: 185 mm
Höhe: 230 mm

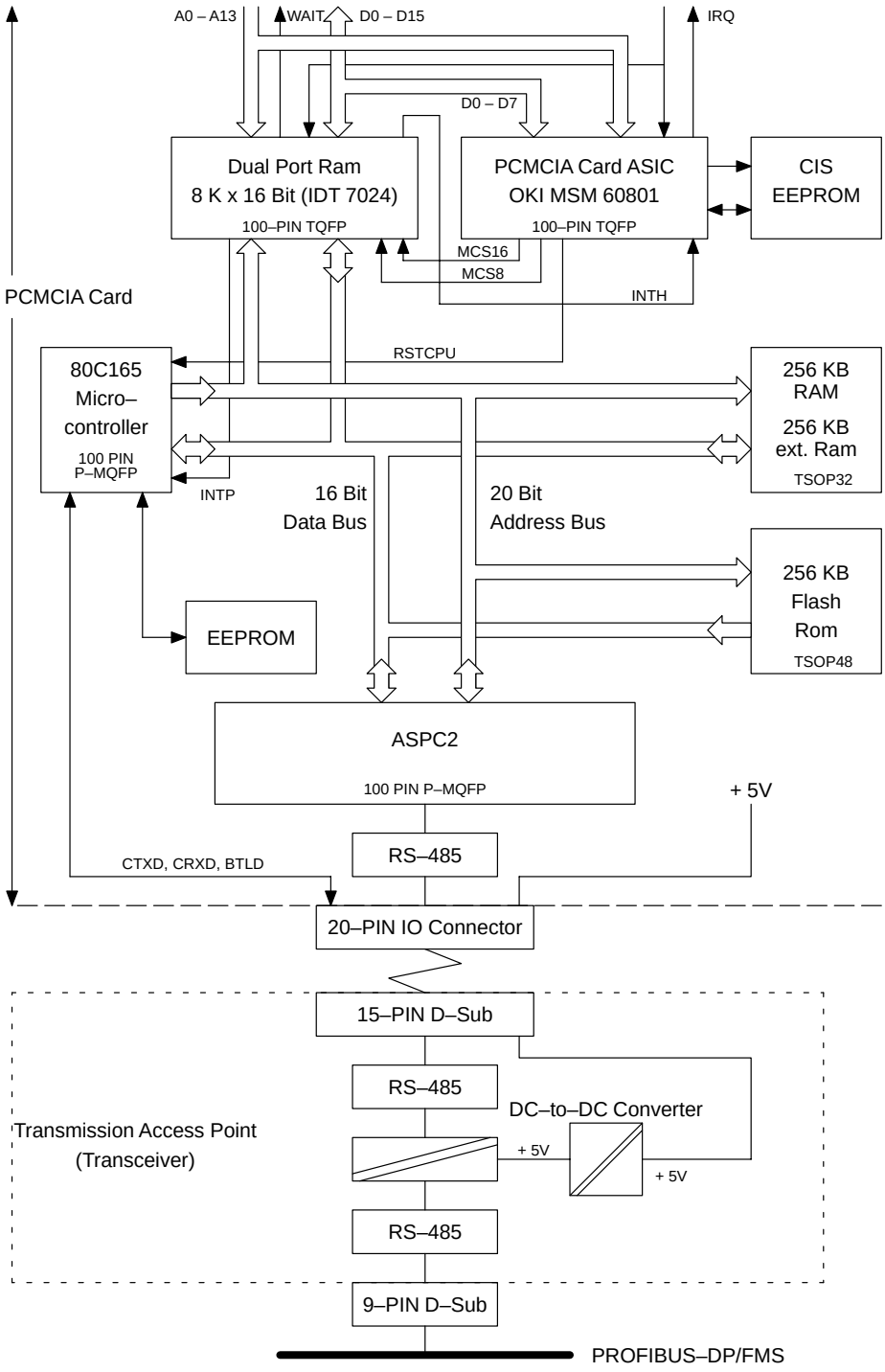


Figure 3 Functional Block Diagram of the PCMCIA Card + the Transmission Access Point

To Figure 2:
The architecture of the module is based upon an 80386EX microprocessor coupled with a Quantum parallel bus and PCMCIA interface card (PCMCIA PC Card Standard, Release 2.01).
The communications module sends and receives data from the Quantum bus through the dual port ram interface.
The firmware which manages the data exchange between the PCMCIA interface card and the CPU is resident within the flash rom.

To Figure 3:
The PCMCIA card defines the complete interface with the PROFIBUS.
The conversion into the RS–485 standard connection is made by the transceiver (Transmission Access Point).
The PCMCIA card is executed as a Type III and finds use in both communications modules, CRP 811 and NOP 911.
The PCMCIA card is based on the 80C165 microcontroller and PROFIBUS ASIC APSC2. The ASPC2 performs all the tasks related to Layer 2 of the PROFIBUS (corresponding to Layer 2 of the ISO–OSI reference model). The remaining layers are processed with the help of the 80C165 running the protocol software resident in flash rom.

Breite: 185 mm
Höhe: 230 mm

2 Configuration

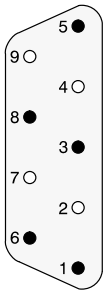
You must configure:

2.1 Mounting Slot in the Subrack

Install the module into any free I/O slot within the TSX Quantum primary subrack.
The individual installation steps should proceed as shown in the accompanying user information.

2.2 PROFIBUS RS–485 Port

The PROFIBUS port utilizes varied Sub–D9 plug connectors 490 NAD 911 02.
The individual connection steps should proceed as shown in the accompanying user manual.



RS–485

Pin	Signal	Function
1	SHIELD	Shield, Protective Ground
3	RxD/TxD-P	Receive/Transmit-Data-P (+)
5	DGND	5 V Signal Ground
6	VP	Positive Supply (+5 V)
8	RxD/TxD-N	Receive/Transmit-Data-N (–)

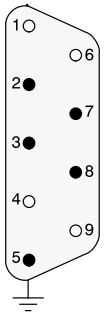
● Pin occupied
○ N/C

Figure 4 PROFIBUS Port Diagram

2.3 RS–232C Port

For diagnosis connect the PC to the RS–232C (Sub–D9) port socket.
This requires one of the following cable configurations:
Serial cable YDL 052 or
Programming cable 990 NAA 263 x0 (Modbus cable)

RS–232C



Socket	Signal	Function
2	D2 (RXD)	Received Data
3	D1 (TXD)	Transmitted Data
5	E2 (GND)	Signal Ground
7	S2 (RTS)	Request to Send
8	M2 (CTS)	Clear to Send

● Pin occupied
○ N/C

Figure 5 RS–232C Port Diagram

Breite: 185 mm
Höhe: 230 mm

3 Diagnosis

The module contain the following LED status display:

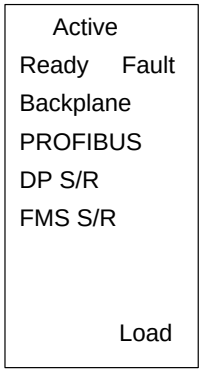


Figure 6 Status LEDs of the CRP 811

Table 1 Status LEDs of the CRP 811

LEDs	Color	Function
Active	Green	On: CPU is in ”Run” mode and the backplane communication active Flashing: The flash rom load operation is active
Ready	Green	On: Module in operation
Fault	Red	Off: Error free operation On: Other LEDs are flashing with fault code
Backplane	Green	Off: Error free operation Flashing with fault code: on backplane fault
PROFIBUS	Green	Off: Error free operation Flashing with fault code: on erroneous configuration data or PROFIBUS fault
DP S/R	Green	Fast flashing frequency: Sending/Receiving DP bus data Medium flashing frequency: Configuration Slaves Slow flashing frequency: Waiting for configuration data Flashing with fault code: on erroneous configuration data
FMS S/R	Green	not used
Load	Yellow	Flashing: Configuration data load operation active Flashing with fault code: on load operation fault

Diagnosis through the RS–232C serial port

Required serial port presets:
Baud rate: 19.2 Kbd, 8 Databits, 1 Stopbit, Parity: off

Table 2 Main menu functions callable over the RS–232C port:

Name	Function
(d) DP Data Menu	View PROFIBUS–DP data (CRP 811)
(e) Error Report Menu	View error output
(g) Global Data Menu	View global data / Status
(t) Terminal Setup Menu	RS–232C port settings
(u) Firmware Update Menu	Update CRP 811 firmware
(x) Expert Mode Menu	Extended and password protected expert mode menu

Breite: 185 mm
Höhe: 230 mm

4 Technical Specifications

4.1 Communication Module CRP 811

Assignment	
Device	TSX Quantum at Modsoft version 2.32 / 2.4 / 2.51
	TSX Quantum at Concept version 2.2
Module Area	I/O area of the primary subrack
Compatible CPU Modules	140 CPU 113 02 (256 KB),140 CPU 113 03 (512 KB) 140 CPU 213 04 (768 KB), 140 CPU 424 02 (2 MB)
Number CRP per Quantum	2 with CPU 113 2 with CPU 213 6 with CPU 424 *) No Quantum Hot Stand By
Updating of time with 32 slaves (for every 16 bit inputs, 16 bit outputs)	4 ms with CPU 424
Necessary Configuration Tools for Modsoft	332 SPU 833 01, PROFIBUS–DP configuration pack (Engl.) 332 SPU 833 02, PROFIBUS–DP configuration pack (Germ.)
Necessary Configuration Tools for Concept	TLX L FBC M, PROFIBUS DP Configuration tool (Engl.) TLX L FBC M, PROFIBUS DP Configuration tool (Germ..) TLX L FBC M, PROFIBUS DP Configuration tool (Franz.)) TLX L FBC M, PROFIBUS DP Configuration tool (Span.)
PNO–Ident–No.	5506
Device Data Base (DDB)	ASA_5506.GSD
Supply Voltage	
over the Internal I/O Bus	5 VDC, max. 1.2 A
Data Interface	
PROFIBUS	Up to 12 Mbps off the transceiver RS–485 port
RS–232C Baud rate max. line length	as per DIN 66 020, non–isolated 19.2 Kbps default 3 m shielded cable
Backplane	Quantum parallel bus
Processor	
Microcontroller	25 MHZ Intel 80386EX in the Quantum module (Controller) Siemens 80C165 and Siemens ASIC ASPC2 in the PCMCIA card

Memory

RAM	256 KB for program data + 8 KB DPR in the Quantum module 512 KB for program data + 16 KB DPR in the PCMCIA card
EEPROM	128 Bytes in the PCMCIA–Karte
Flash Rom	256 KB in the Quantum module 256 KB in the PCMCIA card

Mechanical Design

Dimensions	Width = 40.34 mm (standard–size module) Quantum module with PCMCIA Type III card mounted
Weight	0.68 kg (gross)

Environmental Conditions

System Data	See the Quantum User Manual, Ch. 3.1
Power Dissipation	max. 6.5 W

4.2 PROFIBUS–DP with CRP 811

Transmission Specifications

Bus Nodes	max. 32
Bus lengths, transmission rates (for 12 Mbps cable)	max. 1.2 km at 9.6 Kbps max. 1.2 km at 19.2 Kbps max. 1.2 km at 93.75 Kbps max. 1 km at 187.5 Kbps max. 0.5 km at 500 Kbps max. 0.2 km at 1,5 Mbps max. 0.1 km at 3 Mbps max. 0.1 km at 6 Mbps max. 0.1 km at 12 Mbps
Transmission media (per meter)	shielded twisted pair KAB PROFIB, PROFIBUS cable up to 12 Mbps, rigid
Connection Interface	EIA RS–485
Bus Connector (Cable Termination)	490 NAD 911 01, 490 NAD 911 02 (as per Norm 390 / 220 / 390 Ω for 12 Mbps cable)
Stub Cabling	none (except 1 x 3 m from the bus monitor)

Breite: 185 mm
Höhe: 230 mm

Bus Specifications

Node Type	Master Class 1
Bus–Access Procedure	Master/Slave to DP bus slaves
Transmission Procedure	half–duplex
Frame Length	max. 255 Bytes
Data Unit Length	max. 246 Bytes
Data Security	hamming distance, HD = 4
Node Addresses	1 ... 126
FDL Send/Req. Data Services	for slave services: parameter assignment, configuration, diagnosis, data transfer

Master Class 1 DP Bus Functionality

Read Diagnostic Information from DP Bus Slave	on slave initialization, automatically, should new slave diagnostic data be available, data filed in state ram area (Input Reference 3x) n x INT8 n = 0 no filing of diagnostic information n = 6 default value for standard diagnostic data
Send Parameter Data to DP Bus Slave	only on slave initialization, Uses parameter data from the DP bus configuration tool and DP bus slave device master data
Send Configuration Data to DP Bus Slave	only on slave initialization, Uses configuration data from the DP bus configuration tool and DP bus slave device master data

Operation

Cyclically transfer in– & output data from the state ram

Output	Output Reference 0x and 4x (Boolean, packed) Output Reference 4x (Integer 8 / 16 / 32, Unsigned 8 / 16 / 32, RAW / String, packed e.g. ASCII)
Input	Input Reference 1x and 3x (Boolean, packed) Input Reference 3x (Integer 8 / 16 / 32, Unsigned 8 / 16 / 32, RAW / String, packed e.g. ASCII)

AS–BDEA 203
PROFIBUS–DP Coupler
Module Description

The **AS–BDEA 203** is a PROFIBUS–DP coupling module adhering to DIN 19 245 Parts 1 and 3 with integrated (non–isolated) power supply. It is used to drive the remote I/O modules of the Modicon TSX Compact family. It provides a 5 VDC supply at 1.6 A for the modules on the parallel I/O bus.

The AS–BDEA 203 can address a maximum of 18 I/O modules (288 I/Os) via the subracks DTA 200, DTA 201 or DTA 202. With the exception of intelligent modules, all analog and discrete Compact I/O modules can be employed. When analog modules are utilized, there is a particular total data volume which may not be exceeded.

The device master data file from the 381 SWA 000 00 discette must be utilized for AS–BDEA 203 configuration.

The following module specific information will be presented in this description:

- ☐ Features and Function
- ☐ Configuration
- ☐ Diagnosis
- ☐ Technical Specifications

Breite: 185 mm
Höhe: 230 mm

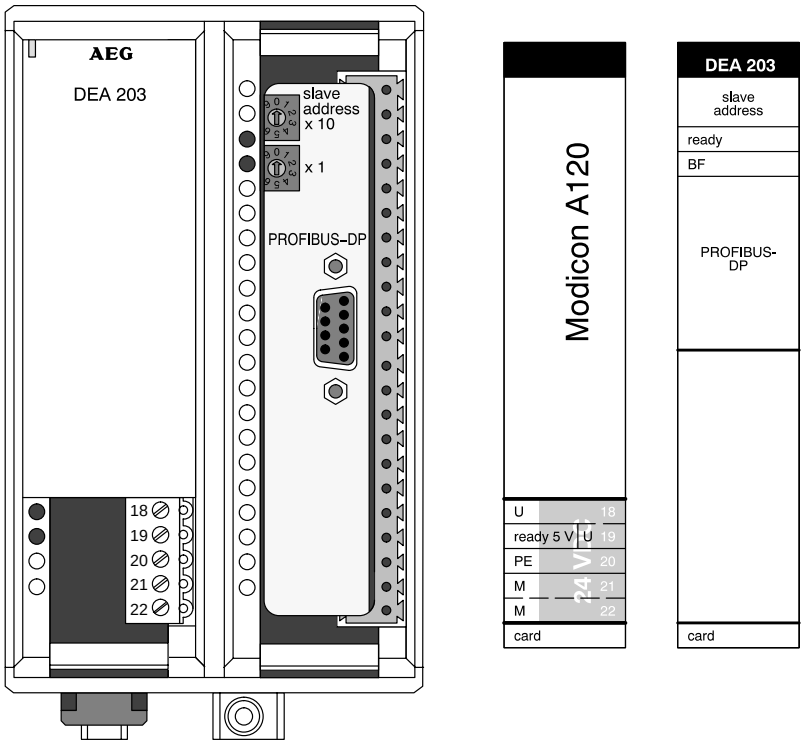


Figure 1 AS–BDEA 203 Front View and Label Inlays

1 Features and Function

1.1 Features

- ☐ Standardized, isolated PROFIBUS Port
- ☐ Transmission rates of up to 12 Mbps
- ☐ Automatic adaptation to master transmission rate setting
- ☐ Slave address adjustment per rotary switch.
- ☐ DIP switch adjustment of disconnection behavior

1.2 Functional Details

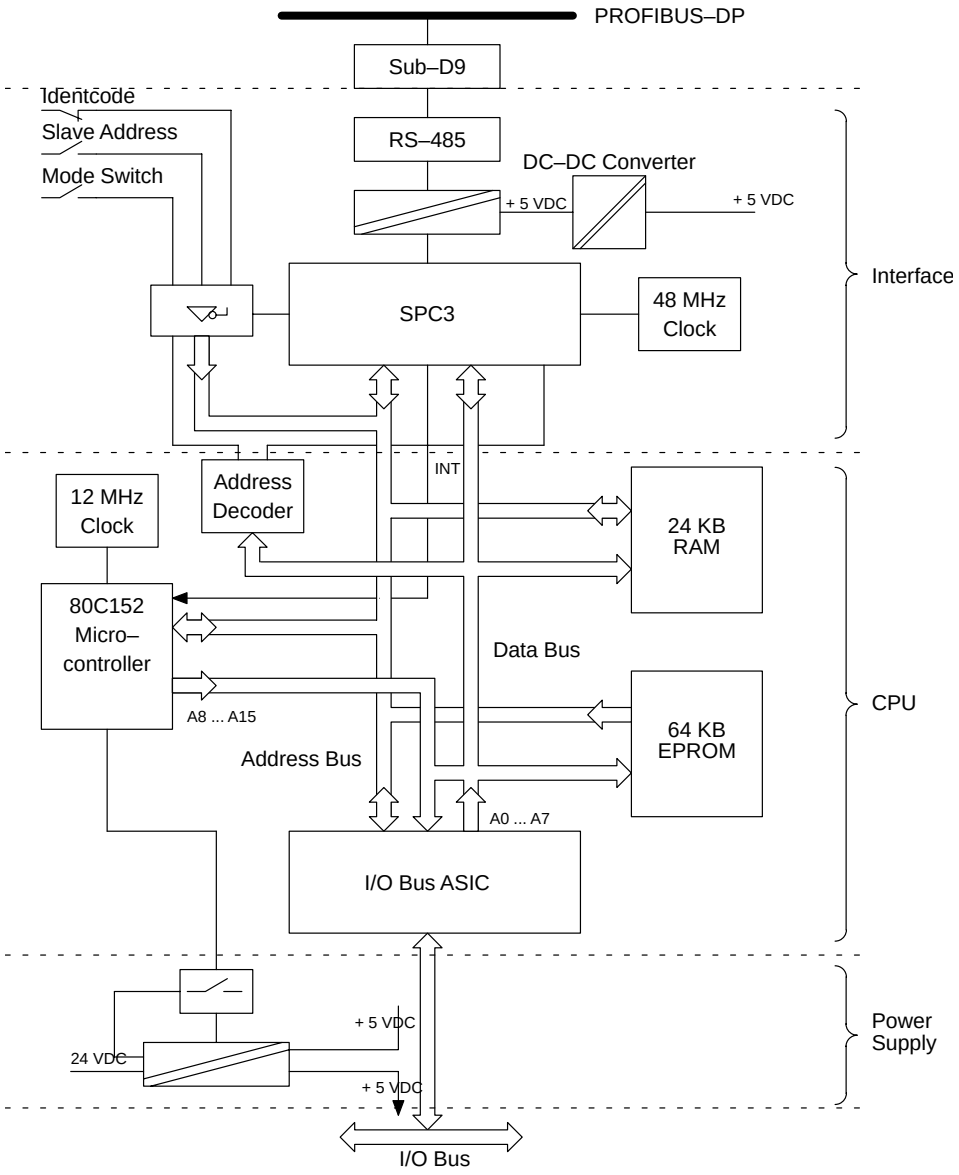


Figure 2 AS–BDEA 203 functional details

The AS–BDEA 203 serves as the coupling element between the PROFIBUS–DP and the internal I/O bus.
The set disconnection behavior is activated by watchdog when PROFIBUS communication is interrupted longer then the supervision time set by the master.

Breite: 185 mm
Höhe: 230 mm

The AS–BDEA 203 collects messages from the associated modules and reports these further to the master as diagnostic information.

2 Configuration

The following configuration tasks must be performed:

2.1 Settings (Slave Address, Disconnection Behavior)

2.1.1 Slave Address (x10, x1)

The slave address (node address) is to be set on the front panel ”x10, x1” rotary switches. Addresses from 1 ... 99 are allowed (0=as shipped).

2.1.2 Disconnection Behavior (S2, S3)

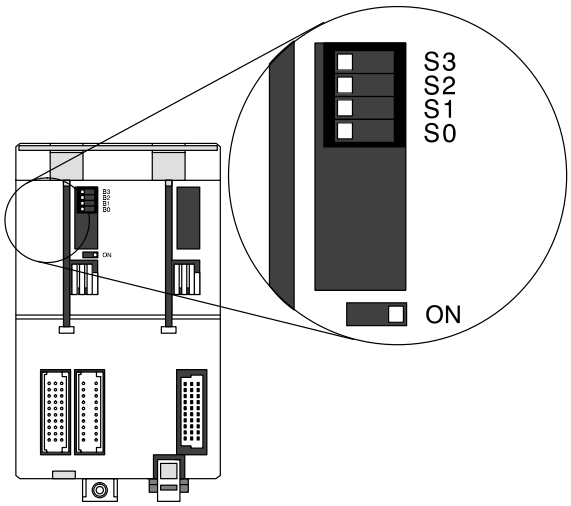


Figure 3 Module rear view

* As shipped

Figure 4 DIP Switch Settings

S0 and S1 settings are meaningless.

2.2 I/O Expansion Limitations

Arbitrary I/O combinations are only possible with discrete I/O modules. Use of analog I/O modules restricts total data volume to a particular level.
Total data volume is the sum of data from the PROFIBUS master to the AS–BDEA 203 (D out), and from the AS–BDEA 203 to the PROFIBUS master (D in).
The feasibility of a particular combination can be verified with the following tables. The first table lists data volume by respective module (D out / D in) in bytes.
The data volume of all employed modules through the AS–BDEA 203 to the PROFIBUS master (D in sums) must </= 244 bytes.

In accordance with the (D in) data volume, this table permits the data volume calculation for PROFIBUS master to AS–BDEA 203 (D out).
With the second table the (D out) data volumes of all employed modules is to be checked against the max. permissable (D out) data volume.

Breite: 185 mm
Höhe: 230 mm

Table 1 Data volume by module

Module	D in Data Volume (Bytes)	D out Data Volume (Bytes)
DEP 208, DEP 210, DEP 211	1	0
DAP 204, DAP 208, DAP 210	0	1
DAP 212, DAP 220, DAP 292	1	1
DEO 216, DEP 214, DEP 215, DEP 216, DEP 217, DEP 218, DEP 220, DEP 296, DEP 297, DEX 216	2	0
DAO 216, DAP 216, DAP 217, DAP 218, DAX 216	0	2
DAU 202	0	4
DAU 208	0	16
ADU 204, ADU 205	10	0
ADU 206, ADU 216	10	1
ADU 210	10	4
ADU 214	18	8

Table 2 Max. permissable ”D out” data volume in respect to ”D in” data volume

D in Data Volume Sums (Bytes)	Max. D out Data Volume Sums (Bytes)
241 ... 244	144
233 ... 240	152
225 ... 232	160
217 ... 224	168
209 ... 216	176
0 ... 208	184

2.3 Subrack Mounting Slot

Install the module in DTA 200 primary subrack slot 0.
The individual installation steps are to be carried out in adherence with the accompanying user documentation.

2.4 Power Supply Connection

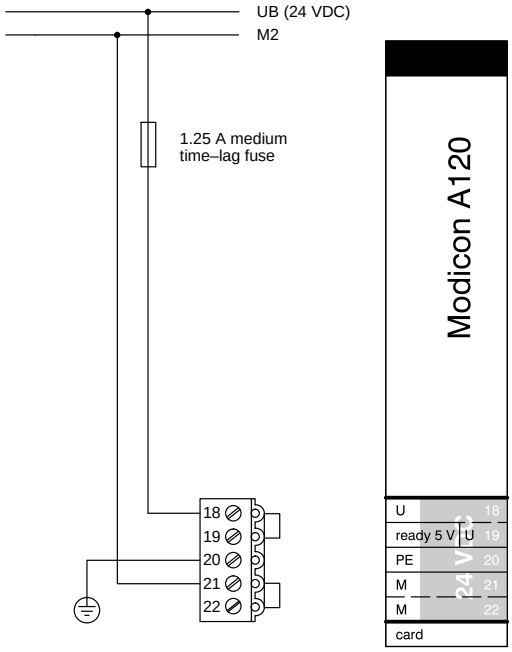


Figure 5 Connection example

Caution: The module's integrated power supply is non–isolated. Improper connection, e.g. absence of the M2 connection, can lead to module destruction.

Enter system relevant power supply information in the label inlay.
Noise immunity can be improved when by–pass capacitors are installed at the power supply module U and M terminals.
Details can be found in the User Manual ch. "A120 Grounding Procedures".

Breite: 185 mm
Höhe: 230 mm

2.5 PROFIBUS Connection

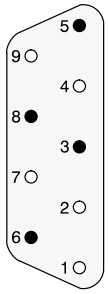
The PROFIBUS port utilizes varied Sub–D9 plug connectors:

□ 490 NAD 911 02 for transmission rates up to 12 Mbps or

□ PBS1 for transmission rates up to 500 Kbps.

The individual installation steps are to be carried out in adherence with the accompanying user documentation.

PROFIBUS–DP



Pin	Signal	Function
3	RxD/TxD–P	Receive/transmit data (+)
5	DGND	Signal ground
6	VP	+5 VDC supply
8	RxD/TxD–N	Receive/transmit data negated (–)

● Pin occupied
○ N/C

Figure 6 PROFIBUS port pin assignments

3 Diagnosis

The module front plate contains the following displays:

Table 3 AS–BDEA 203 LED status display

No.	Label Inlay Identifier	Color	Function
18 (left)	U	Green	24 VDC supply present
19 (left)	ready 5 V	Green	Module ready for service, 5 VDC output voltage present
3 (right)	ready	Green	Coupler ready
4 (right)	BF	Red	Bus coupling faulty (bus failure), Probable cause: The AS–BDEA is not parameterized and initialized, the PROFIBUS–DP protocol is not running

4 Technical Specifications

4.1 AS–BDEA 203

Assignment	
System	TSX Compact (A120, 984)
Module area	Slot 0 of DTA 200 primary backplane
Identcode	Hex A203, entry through the device master data file type 381 SWA 000 00
Power Supply	
External input voltage	UB = 24 VDC, max. 0.85 A
Primary fusing	1.25 A medium time–lag fuse
Power on current	20 A, time constant = 1 ms
Tolerances, limiting values	Refer to the TSX Compact User Manual, ch. ”Technical Specifications”
Reference potential M	M2
Protective earth	PE
Secondary voltage	5.15 VDC, max. 1.6 A, non–isolated
Buffering time	Typically 5 ms for 24 VDC
Overload protection	Through current limiting
Data Interface	
PROFIBUS–DP	Through a potential–free RS–485 interface up to 12 Mbps
Pin assignments	Refer to ch. PROFIBUS Connection Figure 6
Back plane	Parallel I/O bus, refer to TSX Compact User Manual, ch. ”Technical Specifications”
Processor	
Processor type	Intel 80C152 / 12 MHz
Data memory	32 KB RAM
Firmware	64 KB EPROM
Mechanical Design	
Module	Standard double–size module
Format	3 HE, 16 T
Weight	Approx. 500 g
Connection Styles	
Power supply	5–pole screw/plug–in terminal block
PROFIBUS	Sub–D9 socket, matching to 490 NAD 911
Back plane	2 plug connectors 1/3 C30M, 1 socket connector 1/3 R30F

Breite: 185 mm
Höhe: 230 mm

Environmental Characteristics

Regulations	Meets VDE 0160, UL 508
System data	Refer to TSX Compact User Manual, ch. ”Technical Specifications”
Permissable ambient temperature	0 ... +60 degrees C.
Power dissipation	Typically 6 W

4.2 AS–BDEA 203 on the PROFIBUS–DP

Transmission Specifications

Nodes per bus	Max. 32
Bus lengths, transmission rates	max. 1.2 km at 9.6 Kbps or at 19.2 Kbps or at 93.75 Kbps max. 1 km at 187.5 Kbps max. 0.5 km at 500 Kbps max. 0.2 km at 1.5 Mbps max. 0.1 km at 3 Mbps or at 6 Mbps or at 12 Mbps
Bulk transmission media	Shielded twisted pair (S–UTP) KAP PROFIB, PROFIBUS cable up to 12 Mbps, rigid
Connection interface	Adhering to EIA RS–485
Cable termination	As per Norm 390 / 220 / 390 Ω
Stub cabling	None
Data security	Hamming distance, HD = 4

Bus Specifications

Node type	Slave
Node addresses	1 ... 99

Operation

Cyclically transfer in– & output data from the state ram

DP Bus Byte Output	Output Reference 0x (Boolean, packed) Output Reference 4x (Integer8, unpacked; Unsigned8, unpacked; RAW, packed e.g. ASCII)
DP Bus Byte Input	Input Reference 1x (Boolean, packed) Input Reference 3x (Integer8, unpacked; Unsigned8, unpacked; RAW, packed e.g. ASCII)
Bus Word Output	Output Reference 0x (Boolean) Output Reference 4x (Integer16 = Unsigned16 = RAW)
Bus Word Input	Input Reference 1x (Boolean) Input Reference 3x (Integer16 = Unsigned16 = RAW)